SAMSUNG

GSM TELEPHONE
SGH-E800

SERVICE Manual

GSM TELEPHONE

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ELECTRONICS

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BASIC.

1. SGH-E800 Specification

1. GSM General Specification

	GSM900 Phase 1	EGSM 900 Phase 2	DCS1800 Phase 1
Freq. Band[MHz] Uplink/Downlink	890~915 935~960	880~915 925~960	1710~1785 1805~1880
ARFCN range	1~124	0~124 & 975~1023	512~885
Tx/Rx spacing	45MHz	45MHz	95MHz
Mod. Bit rate / Bit Period	270.833kbps 3.692us	270.833kbps 3.692us	270.833kbps 3.692us
Time Slot Period / Frame Period	576.9us 4.615ms	576.9us 4.615ms	576.9us 4.615ms
Modulation	0.3GMSK	0.3GMSK	0.3GMSK
MS Power	33dBm~5dBm	33dBm~5dBm	30dBm~0dBm
Power Class	5pcl ~ 19pcl	5pcl ~ 19pcl	0pcl ~ 15pcl
Sensitivity	-102dBm	-102dBm	-100dBm
TDMA Mux	8	8	8
Cell Radius	35Km	35Km	2Km

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2. GSM TX power class

TX Power control level	GSM900
5	33±3 dBm
6	31±3 dBm
7	29±3 dBm
8	27±3 dBm
9	25±3 dBm
10	23±3 dBm
11	21±3 dBm
12	19±3 dBm
13	17±3 dBm
14	15±3 dBm
15	13±3 dBm
16	11±5 dBm
17	9±5 dBm
18	7±5 dBm
19	5±5 dBm

TX Power control level	DCS1800
0	30±3 dBm
1	28±3 dBm
2	26±3 dBm
3	24±3 dBm
4	22±3 dBm
5	20±3 dBm
6	18±3 dBm
7	16±3 dBm
8	14±3 dBm
9	12±4 dBm
10	10±4 dBm
11	8±4dBm
12	6±4 dBm
13	4±4 dBm
14	2±5 dBm
15	0±5 dBm

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2. SGH-E800 Circuit Description

1. SGH-E800 RF Circuit Description

1) RX PART

1. ASM(U100) → Switching Tx, Rx path for GSM900, DCS1800 by logic controlling.

2. ASM Control Logic (Q100, Q102) → Truth Table

	VC1	VC2
GSM Tx Mode	H	L
DCS Tx Mode	L	H
GSM Rx Mode	L	L
DCS Rx Mode	L	L

3. FILTER

Converting electromagnetic field wave to acoustic wave and then pass the specific frequency band.

- GSM FILTER (F101) → For filtering the frequency band between 925 and 960 MHz
- DCS FILTER (F102) → For filtering the frequency band between 1805 and 1880 MHz.

4. VC-TCXO (OSC101)

This module generates the 26MHz reference clock to drive the logic and RF. After additional process, the reference clock applies to the U102 Rx IQ demodulator and Tx IQ modulator. And then, the oscillator is controlled by serial data to select channel and use fast lock mode for GPRS high class operation.

5. Transceiver (U102)

The receiver front-end which amplifies the GSM, DCS aerial signal, converts the chosen channel down to a low IF signal of 100 kHz. The first stage is composed of symmetrical low noise amplifiers (LNAs). They are matched to 50 ohm. The LNAs are followed by an IQ down mixer. It consists of two mixers in parallel but driven by quadrature out of phase LO signals. The In phase(I) and Quadrature phase(Q) IF signals are low pass filtered to provide protection from high frequency offset interferes. The low IF I and Q signals are then fed into the channel filter. The front-end low IF I and Q outputs enter the integrated bandpass channel filter with provision for five 8 dB gain steps in front of the filter.

2) TX PART

Baseband IQ signal fed into offset PLL, this function is included inside of U102 chip. OSC100 chip generates modulator signal which power level is about 6.5dBm and fed into Power Amplifier(U101). The PA output power and power ramping are well controlled by Auto Power Control circuit. We use offset PLL below table.

Modulation Spectrum	200kHz offset 30 kHz bandwidth	GSM	-36dBm
		DCS	-36dBm
	400kHz offset 30 kHz bandwidth	GSM	-36dBm
		DCS	-36dBm
	600kHz ~ 1.8MHz offset 30 kHz bandwidth	GSM	-51dBm
		DCS	-56dBm

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2. Baseband Circuit description of SGH-E800

1. PCF50601 (U400)

1.1. Power Management

Ten low-dropout regulators designed specifically for GSM applications power the terminal and help ensure optimal system performance and long battery life. A programmable boost converter provides support for 1.8V, 3.0V, and 5.0V SIMs, while a self-resetting, electronically fused switch supplies power to external accessories. Ancillary support functions, such as RTC module and High Voltage Charge pump, Clock generator, aid in reducing both board area and system complexity.

I2C BUS serial interface provides access to control and configuration registers. This interface gives a microprocessor full control of the PCF50601 and enables system designers to maximize both standby and talk times.

Supervisory functions. including a reset generator, an input voltage monitor, and a temperature sensor, support reliable system design. These functions work together to ensure proper system behavior during start-up or in the event of a fault condition(low microprocessor voltage, insufficient battery energy, or excessive die temperature).

1.2. Backlight Brightness Modulator

The Backlight Brightness Modulator (BBM) contains a programmable Pulse-width modulator (PWM) and FET to modulate the intensity of a series of LED's or to control a DC/DC converter that drives LCD backlight.

This phone (SGH-E800) use PWM control to contrast the backlight brigtness.

1.3. Clock Generator

The Clock Generator (CG) generates all clocks for internal and external usage. The 32768 Hz crystal oscillator provides an accurate low clock frequency for the PCF50601 and other circuitry.

2. LCD Connector

LCD is consisted of main LCD(color 65K TFT LCD).

Chip select signals in the U500, LCD_CS, can enable LCD. BACKLIGHT signal enables white LED of main LCD. These signal is from U400.

16-bit data lines(LD(0)~LD(15)) transfers data and commands to LCD. Data and commands use "RS" signal. If this signal is high, Inputs to LCD are commands. If it is low, Inputs to LCD are data. The signal which informs the input or output state to LCD, is required. But this system is not necessary this signal. So "L_WR" signal is used to write data or commands to LCD. Power signals for LCD are "LCD_VDD".

3. IRDA

This system uses IRDA module, HSDL_3208, Agilent's. This has signals, "IRDA_DOWN"(enable signal), "RXD0"(input data) and "TXD0"(output data). These signals are connected to OM6359. It uses two power signals. "VDD2" is used for circuit and "VBAT" is used for LED.

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4. Key

This is consisted of key interface pins among OM6359, KBIO(0:7). These signals compose the matrix. Result of matrix informs the key status to key interface in the OM6359. Power on/off key is seperated from the matrix. So power on/off signal is connected with PCF50601 to enable PCF50601. Key LED is consisted of five white LED for sub key and eight white LED for main key. white LED for sub key use the 3.3V supply voltage.

"SUB_BACKLIGHT_KEY_ON" signal enables 3.3V LDO for sub key backlight.

Eight white LED use the "VDD_KEY" supply voltage.

OM6359 enables eight white LED.

"FLIP" informs the status of slide (open or closed) to the OM6359. This uses the hall effect IC, SH248GSP.

A magnet under main LCD enables SH248GSP.

5. EMI ESD Filter

This system uses the EMI ESD filter, EMIF09 to protect noise from IF CONNECTOR part.

6. IF connetor

It is 18-pin connector. They are designed to use VBAT, V_EXT_CHARGE, TXD0, RXD0, RTS0, CTS0, JIG_REC, CHARGER_OK, RXD1, TXD1, AUX_MIC, AUX_SPK and GND. They connected to power supply IC, microprocessor and signal processor IC.

7. Battery Charge Management

A complete constant-current/constant-voltage linear charger for single cell lithium-ion batteries.

If TA connected to phone, "V_EXT_CHARGE" enable charger IC and supply current to battery.

When fault condition caused, "CHG_ON" signal level change low to high and charger IC stop charging process.

8. Audio

EARP_P and EARP_N from OM6359 are connected to the main speaker. AUXSP is connected to the Hands free kit. MIC_P and MIC_N are connected to the main MIC. And AUX_MIC_P and AUX_MIC_N are connected to earmicrophone. YMU765_MA5 is a LSI for portable telephone that is capable of playing high quality music by utilizing FM synthesizer and ADPCM decorder that are included in this device.

As a synthesis, YMU765_MA5 is equipped 32 FM voices and 32 Wave Table voices. Since the device is capable of simultaneously generating up to synchronous with the play of the FM synthesizer, various sampled voices can be used as sound effects.

Since the play data of YMU765_MA5 are interpreted at anytime through FIFO, the length of the data(playing period) is not limited, so the device can flexibly support application such as incoming call melody music distribution service. The hardware sequencer built in this device allows playing of the complex music without giving excessive load to the CPU of the portable telephones. Moreover, the registers of the FM synthesizer can be operated directly for real time sound generation, allowing, for example, utilization of various sound effects when using the game software installed in the portable telephone.

YMU765_MA5 includes a speaker amplifier with high ripple removal rate whose maximum output is 580mW (SPVDD=3.6V). The device is also equipped with conventional function including a vibartor.

For the purpose of enabling YMU765_MA5 to demonstarte its full capablities, Yamaha purpose to use "SMAF:Synthetic music Mobile Application Format" as a data distribution format that is compatible wiht multimedia. Since the SMAF takes a structure that sets importance on the synchronization between sound and images, various contents can be written into it

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including incoming call melody with words that can be used for traning karaoke, and commercial channel that combines texts, images and sounds, and others. The hardware sequencer of YMU765_MA5 directly interprets and plays blocks relevant to systhesis (playing music and reproducing ADPCM with FM synthesizer) that are included in data distributed in SMAF.

9. Memory

Signals in the OM6359 enable two memories. They use only one volt supply voltage, VDD3 in the PCF50601. This system uses Samsung's memory, KBB06B400M-F402. It is consisted of 128M bits flash NOR memory and 256M bits flash NAND memory and 64M bits SCRAM. It has 16 bit data line, HD[0~15] which is connected to OM6359 and MV317SAQ. It has 26 bit address lines, HA[1~26]. CS_NAND and NCSRAM signals is chip select. Writing process, HWR_N is low and it enables writing process to flash memory and SRAM. During reading process, HRD_N is low and it enables reading process to flash memory and SRAM. Each chip select signals in the OM6359 select memory among 2 flash memory and SCRAM. Reading or writing procedure is processed after HWR_N or HRD_N is enabled. Memories use reset, which is VDD3 delay from PCF50601. HA[25] signal enables lower byte of SRAM and HA[26] signal enables higher byte of SRAM.

10. OM6359

OM6359 is consisted of ARM core and DSP core. It has 8x1Kword on-chip program/data RAM, 55 Kwords on-chip program ROM in the DSP. It has 4K*32bits ROM and 2K*32bits RAM in the ARM core. DSP is consisted of KBS, JTAG, EMI and UART. ARM core is consisted of EMI, PIC(Programmable Interrupt Controller), reset/power/clock unit, DMA controller, TIC(Test Interface Controller), peripheral bridge, PPI, SSI(Synchronous Serial Interface), ACC(Asynchronous communications controllers), timer, ADC, RTC(Real-Time Clock) and keyboard interface.
KBIO(0:7), address lines of DSP core and HD[0~15]. HA[1~26], address lines of ARM core and HD[0~15], data lines of ARM core are connected to memory, YMU765, MV317SAQ(Camera DSP Chip).
CS_NAND, NCSRAM, NCSFLASH in the ARM core are connected to each memory. HWR_N and HRD_N control the process of memory. External IRQ(Interrupt ReQuest) signals from each units, such as PMU, need the compatible process. KBIO[0~7] receive the status from key and RXD0/TXD0/irDA_DOWN are used for the communications using IRDA and data link cable(DEBUG_DTR/RTS/TXD/RXD/CTS/DSR).
It has JTAG control pins(TDI/TDO/TCK) for ARM core and DSP core. It recieves 13MHz clock in CKI pin from external TCXO. ADC(Analog to Digital Convertor) part receives the status of temperature, battery type and battery voltage.

11. VC-TCXO-214C6(26MHz)

This system uses the 26MHz TCXO. AFC control signal forms OM6359 control frequency from 26MHz x-tal. It generates the clock frequency. This clock is connected to UAA3536.

12. Camera DSP(MV317SAQ)

Tiger is an Integrated circuit for mobile phone camera. This structure will allow effectiveness for large data management and significantly reduces main processor will get burden.
In hence, Tiger will allow the user to be able to display to LCD direct without burdening the main processor. It also allows to have various kinds of display size on the LCD and snapshot for Jpeg. Digital effect will also be executed on real time base resulting Tiger as being a video co-processor in the mobile platform.
Also, an i80 type processor's 16bit parallel interface of Tiger makes it available for the CPU to interchange the data

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with Tiger. As the additional 8Mbit is usable except 2Mbit buffer embedded in Tiger, the diverse UI data processing which is not a burden to the CPU is available. JPEG encoder and decoder are baseline ISO/IEC 10918-1 JPEG compliance (DCT-based). JPEG decoder supports YUV444, YUV422, YUV420 and YUV411 format standard JPEG image.

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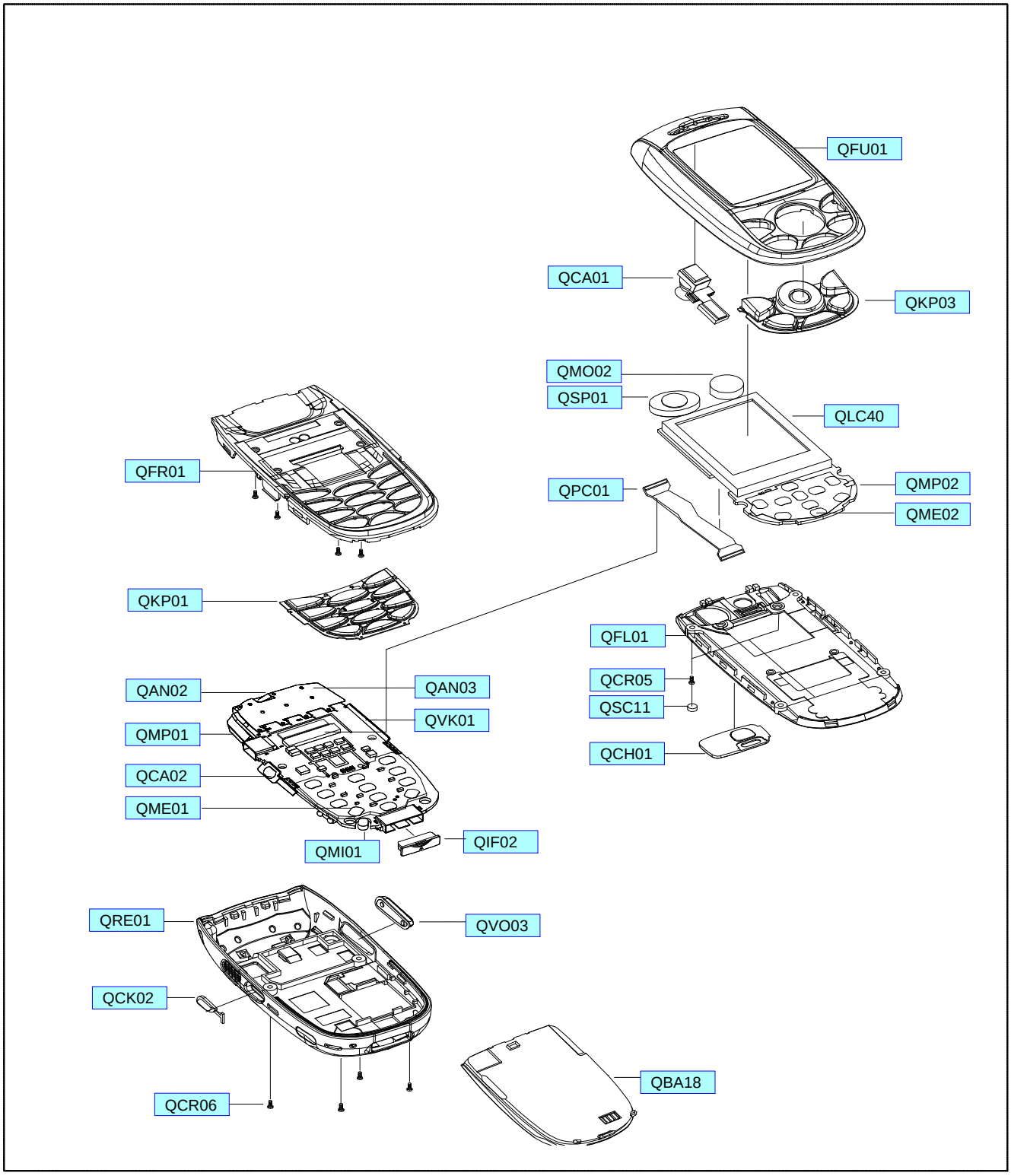
3. SGH-E800 Exploded View and its Parts list

1. Cellular phone Exploded View-1



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2. Cellular phone Parts list

Location NO.		Description	SEC CODE	Remark
QFU01		SLIDE UPPER ASSY	GH75-04459B	
QCA01		CAMERA	GH59-01307A	
QKP03		SUB KEYPAD ASSY	GH75-04462B	
QMO02		MOTOR	3101-001384	
QSP01		SPEAKER	3001-001528	
QLC40		LCD	GH07-00531A	
QPC01		PCB	GH41-00554A	
QMP02		SUB PBA	GH92-01806A	
QME02		SUB METAL DOME SHEET	GH59-01359A	
QFL01		SLIDE LOWER ASSY	GH75-04460B	
QCR05		SCREW	6001-001478	
QSC11		LOWER SCREW CAP	GH73-03014A	
QCH01		CAMERA DUMMY ASSY	GH75-04881A	
QFR01		FRONT COVER	GH75-04458B	
QKP01		MAIN KEYPAD	GH75-04463B	
QAN02		INTENNA ASSY	GH42-00396A	
QAN03		INTENNA GND PLATE	GH42-00396B	
QVK01		UNIT SIDE KEY	GH59-01308A	
QMP01		MAIN PBA	GH92-01805A	
QCA02		UNIT CAMERA KEY	GH59-01313A	
QME01		METAL DOME SHEET	GH59-01358A	
QMI01		MICROPHONE ASSY	GH30-00105A	
QIF02		I/F COVER	GH72-13921B	
QRE01		REAR COVER ASSY	GH75-04461B	
QVO03		VOLKEY	GH72-13120A	
QCK02		CAMERA KEY	GH72-13121A	
QCR06		SCREW	6001-001155	
QBA18		BATTERY	GH43-01328A	

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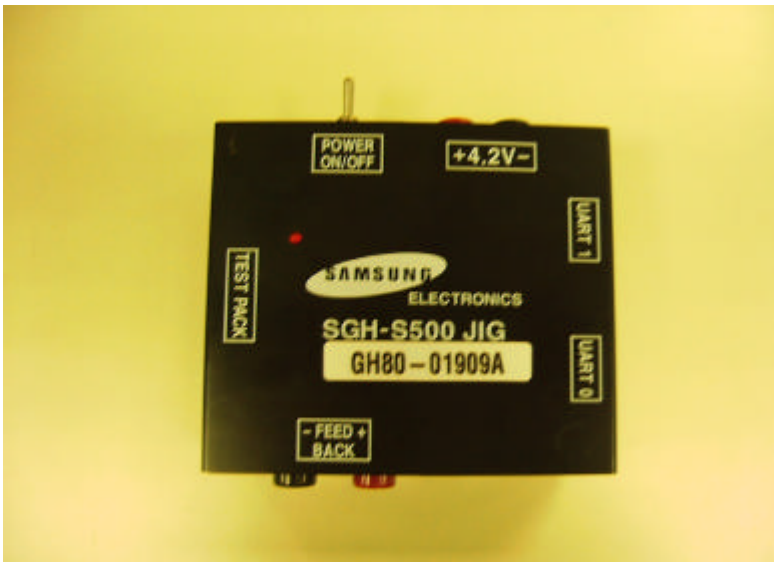
3. Test Jig (GH80-01909A)



3-1. RF Test Cable
(GH39-00283A)

3-2. Test Cable
(GH39-00217A)

3-3. Serial Cable

3-4. Power Supply Cable

3-5. DATA CABLE
(GH39-00219A)

3-6. TA
(GH44-00482A)

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4. SGH-E800 MAIN Electrical Parts List

MAIN	
SEC CODE	Design LOC
0403-001387	ZD300
0403-001427	ZD202
0406-001150	ZD302
0406-001121	ZD201
0406-001194	ZD301
0406-001194	ZD303
0406-001150	ZD304
0504-001134	Q201
0505-001332	Q202
0504-001151	Q100
0504-001151	Q101
0504-001151	Q102
0601-001819	D300
0601-001819	D301
0601-001819	D302
0601-001819	D303
0601-001819	D304
0601-001819	D305
0601-001819	D306
0601-001819	D307
0601-001819	D308
0604-001261	U503
0801-002237	U303
0801-002882	U203
0801-002882	U300
0801-002882	U301
1001-001248	U200
1001-001253	U202
1009-001018	U306
1109-001299	U302
1201-002075	U101
1202-001068	U201
1203-001895	U501
1203-001917	U206
1203-002980	U204
1204-002138	U304
1205-002327	U102
1205-002350	U400
1404-001221	TH201
1405-001093	TH300
1405-001093	TH301
1405-001093	TH302
1405-001082	V200
2007-000138	R127
2007-000140	R131
2007-000140	R132
2007-000140	R201
2007-000140	R203
2007-000140	R214
2007-000140	R223
2007-000140	R226
2007-000140	R311
2007-000141	R104
2007-000141	R228
2007-000141	R229
2007-000142	R123
2007-000144	R106
2007-000148	R112
2007-000148	R124
2007-000148	R202
2007-000148	R207
2007-000148	R225
2007-000148	R400
2007-000151	R401
2007-000157	R231
2007-000162	R100
2007-000162	R101
2007-000162	R102
2007-000162	R208
2007-000162	R210
2007-000162	R221
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2007-000162	R232
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2007-000162	R305

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2007-000162	R306
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2007-000171	R120
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2007-000172	R309
2007-000172	R310
2007-000174	R204
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2007-000174	R319
2007-000174	R320
2007-000242	R107
2007-000566	R109
2007-000566	R115
2007-000636	R236
2007-000636	R237
2007-000775	R328
2007-000839	R330
2007-001284	R219
2007-001284	R220
2007-001288	R108
2007-001288	R114
2007-000138	R127
2007-001308	R110
2007-001308	R111
2007-001308	R116
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2007-001313	R322
2007-001325	R326
2007-001329	R105
2007-001339	R238
2007-001339	R239
2007-002796	R200
2007-002796	R205
2007-002796	R217
2007-002796	R227
2007-007001	R224
2007-007014	R321
2007-007014	R323
2007-007100	R402
2007-007107	R211
2007-007107	R212
2007-007107	R213
2007-007107	R216
2007-007132	R329
2007-007136	R327
2007-007142	R215
2007-007142	R218
2007-007148	R103
2007-007311	R113
2007-007311	R324
2007-007314	R126
2007-007314	R128
2007-007314	R129
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2007-007334	R234
2007-007529	R209
2007-007573	R206
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2203-001405	C319
2203-002443	C310
2203-002687	C318
2203-005053	C111
2203-005056	C227
2203-005056	C228
2203-005057	C107
2203-005057	C109
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2203-005482	C503
2203-005503	C122
2203-005571	C321
2203-005664	C222
2203-006053	C128
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2203-006208	C432
2203-006257	C320
2203-006257	C412
2203-006257	C425
2203-006257	C426
2203-006257	C427
2203-006361	C241
2301-001197	C120
2301-001213	C118
2404-001105	C243
2404-001225	C405
2404-001225	C421
2404-001225	C422
2404-001239	C126
2404-001348	C213
2404-001352	C233
2404-001352	C316
2703-002170	L116
2703-002176	L100
2703-002176	L102
2703-002199	L101
2703-002199	L114
2703-002200	L110
2703-002201	L109
2703-002201	L112
2703-002201	L113
2703-002203	L103
2703-002203	L107
2703-002204	L105
2703-002205	L115
2703-002208	L104
2703-002208	L106
2703-002281	L108
2703-002281	L111

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2801-004285	OSC500
2801-004339	X400
2806-001341	OSC100
2809-001287	OSC101
2901-001246	U307
2901-001295	F500
2901-001295	F501
2901-001295	F502
2901-001295	F503
2901-001295	F504
2901-001295	F505
2901-001295	F506
2901-001295	F507
2901-001295	F508
2901-001295	F509
2904-001469	F101
2904-001513	F100
2904-001514	F102
2909-001246	U100
3301-001105	L400
3708-001853	U502
3709-001244	CN400
3711-005664	BAT301
3710-001994	CN301
3722-002181	CN200
4302-001130	BAT400
GH13-00020A	U500
3705-001347	CN100
1205-002558	U205
0406-001203	ZD502
0406-001203	ZD505
0406-001203	ZD506
0406-001203	ZD507
0406-001203	ZD508
0406-001203	ZD509
0406-001203	ZD510
0406-001203	ZD511
0406-001203	ZD512
0406-001203	ZD513
0504-001100	U305

SUB	
SEC CODE	Design LOC
0402-001617	D608
0402-001617	D609
0403-001446	ZD600
0601-001819	D600
0601-001819	D601
0601-001819	D602
0601-001819	D603
0601-001819	D604
1003-001440	Q600
1203-001895	U603
1203-001917	U600
1203-002862	U604
1203-003328	U601
1209-001555	U602
1405-001082	V600
1405-001093	TH600
2007-000140	R614
2007-000143	R611
2007-000143	R612
2007-000148	R600
2007-000148	R601
2007-000162	R613
2007-000165	R609
2007-000171	R608
2007-000174	R602
2007-000174	R603
2007-000174	R604
2007-000174	R605
2007-000174	R606
2007-003001	R607
2007-007193	R610
2203-000679	C608
2203-001652	C600
2203-005061	C607
2203-005065	C603
2203-005065	C606
2203-005065	C609
2203-005065	C610

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2203-005065	C611
2203-005065	C613
2203-005065	C614
2203-005482	C601
2203-005482	C602
2203-005482	C612
2203-005840	C616
2404-001086	C605
2404-001101	C604
2703-002714	L600
3708-001853	CN601
3708-001890	CN600
4715-001077	D610
3711-005661	CN602

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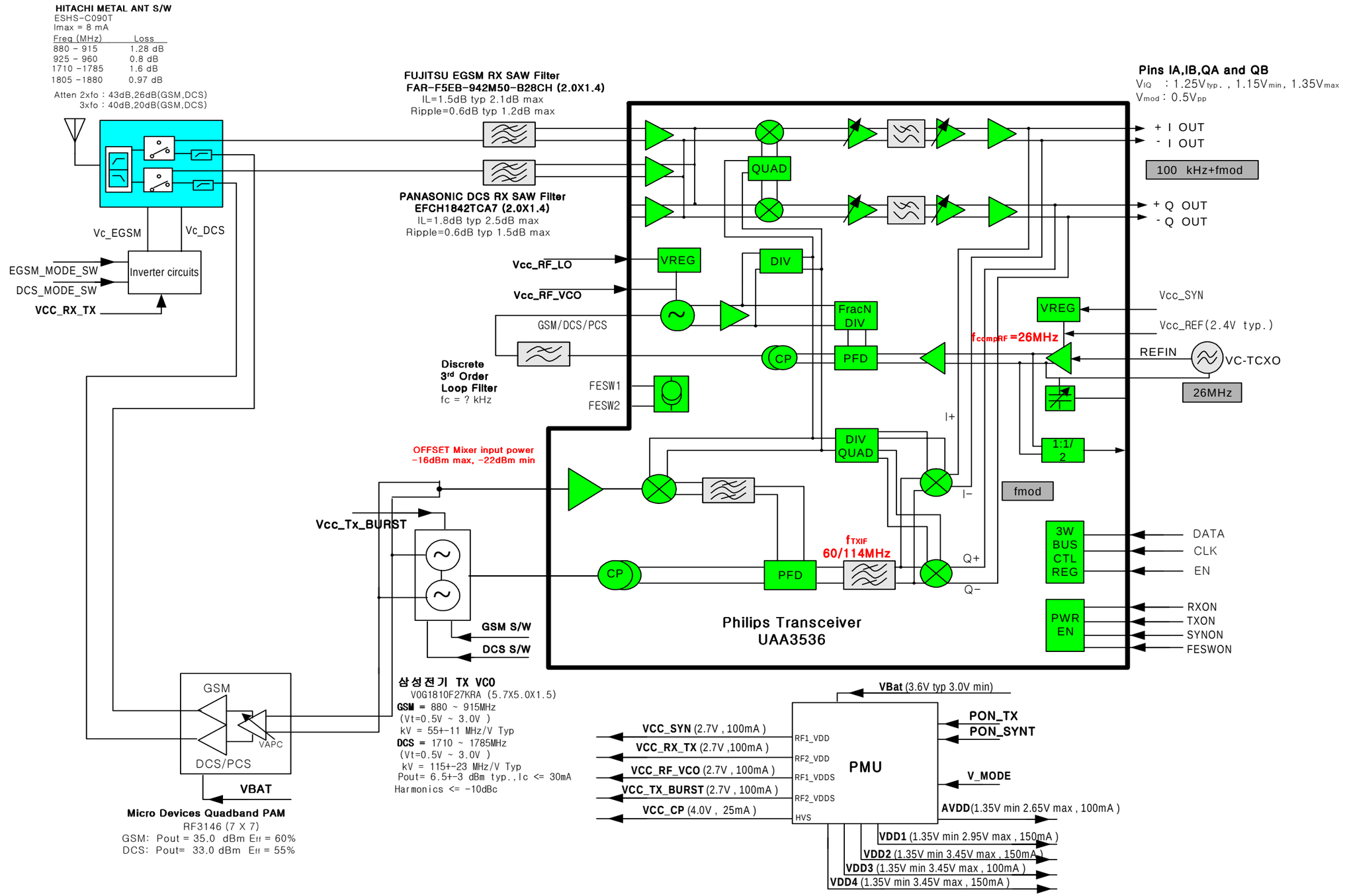
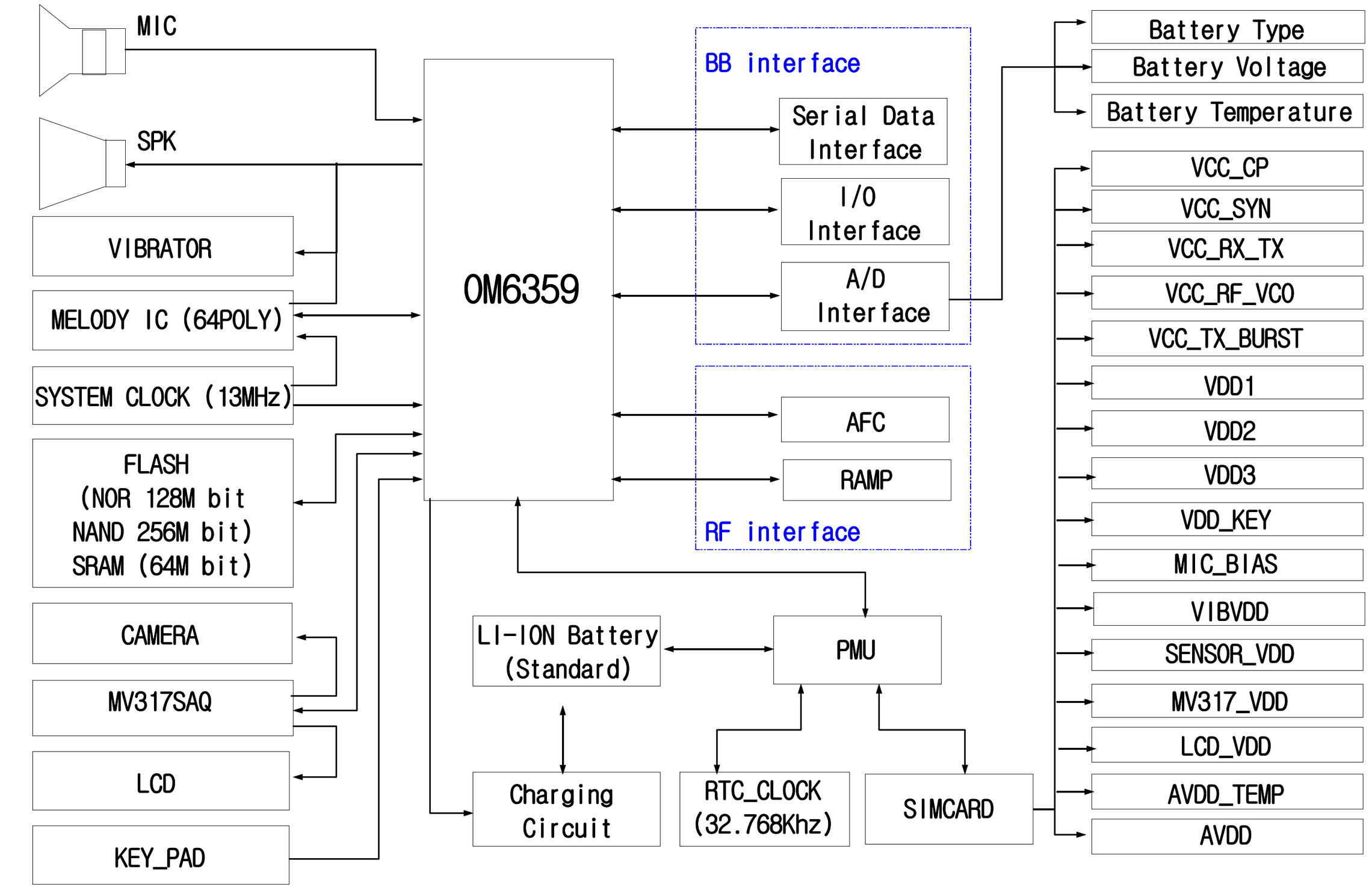
5. SGH-E800 Block Diagrams

1. RF Solution Block Diagram

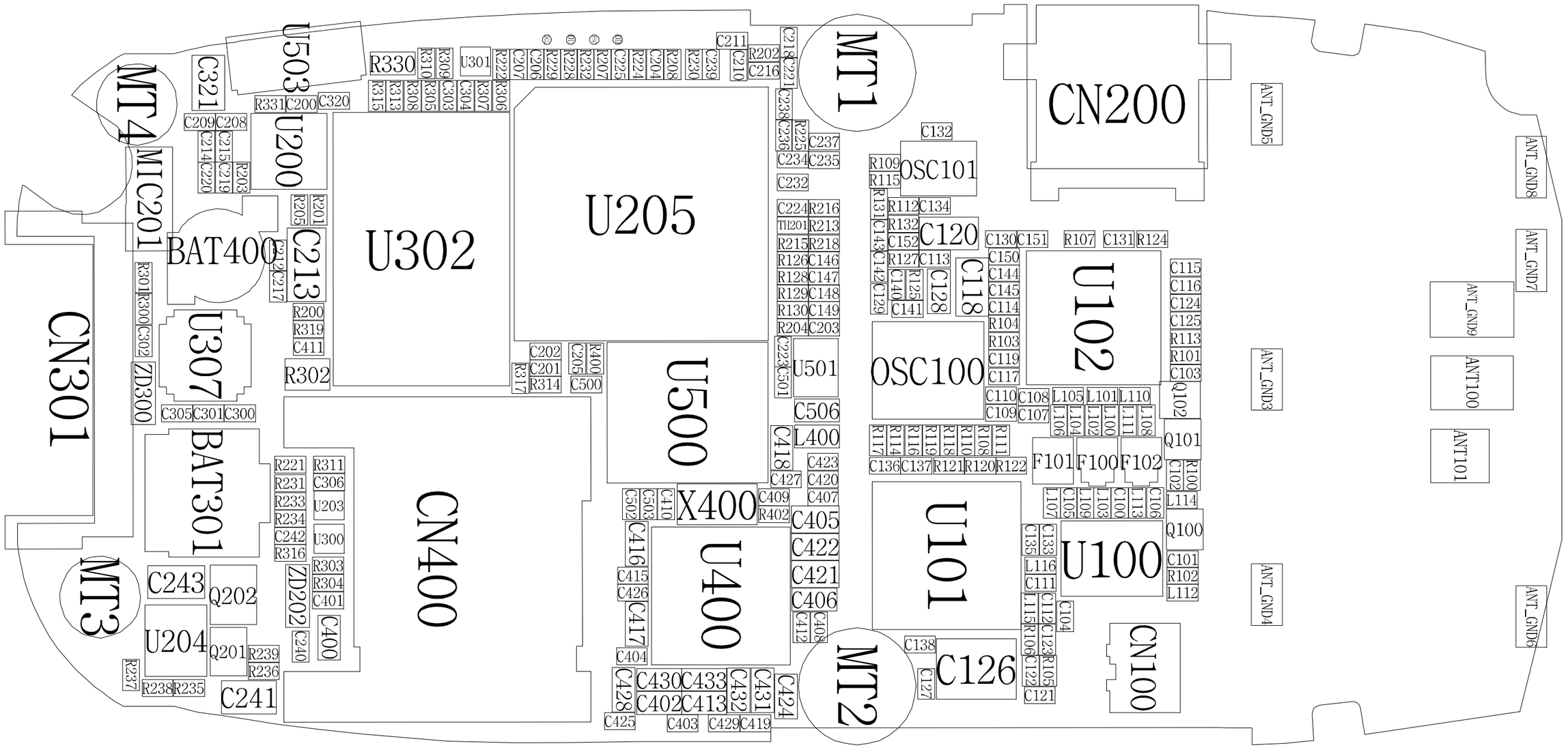


2. Base Band Solution Block Diagram



6. SGH-E800 PCB Diagrams

1. Main PCB Top Diagram



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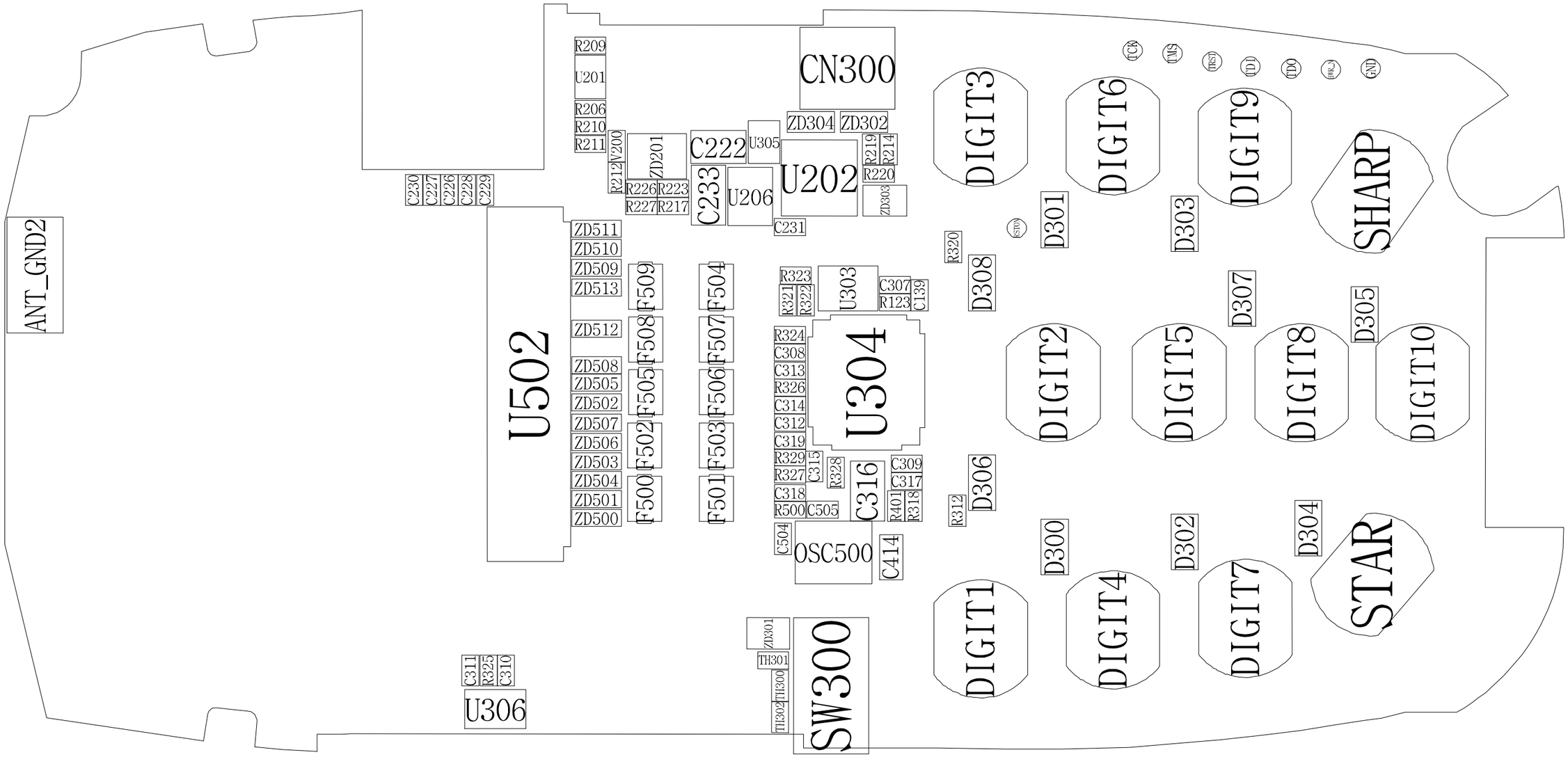
2. Main PCB Bottom Diagram



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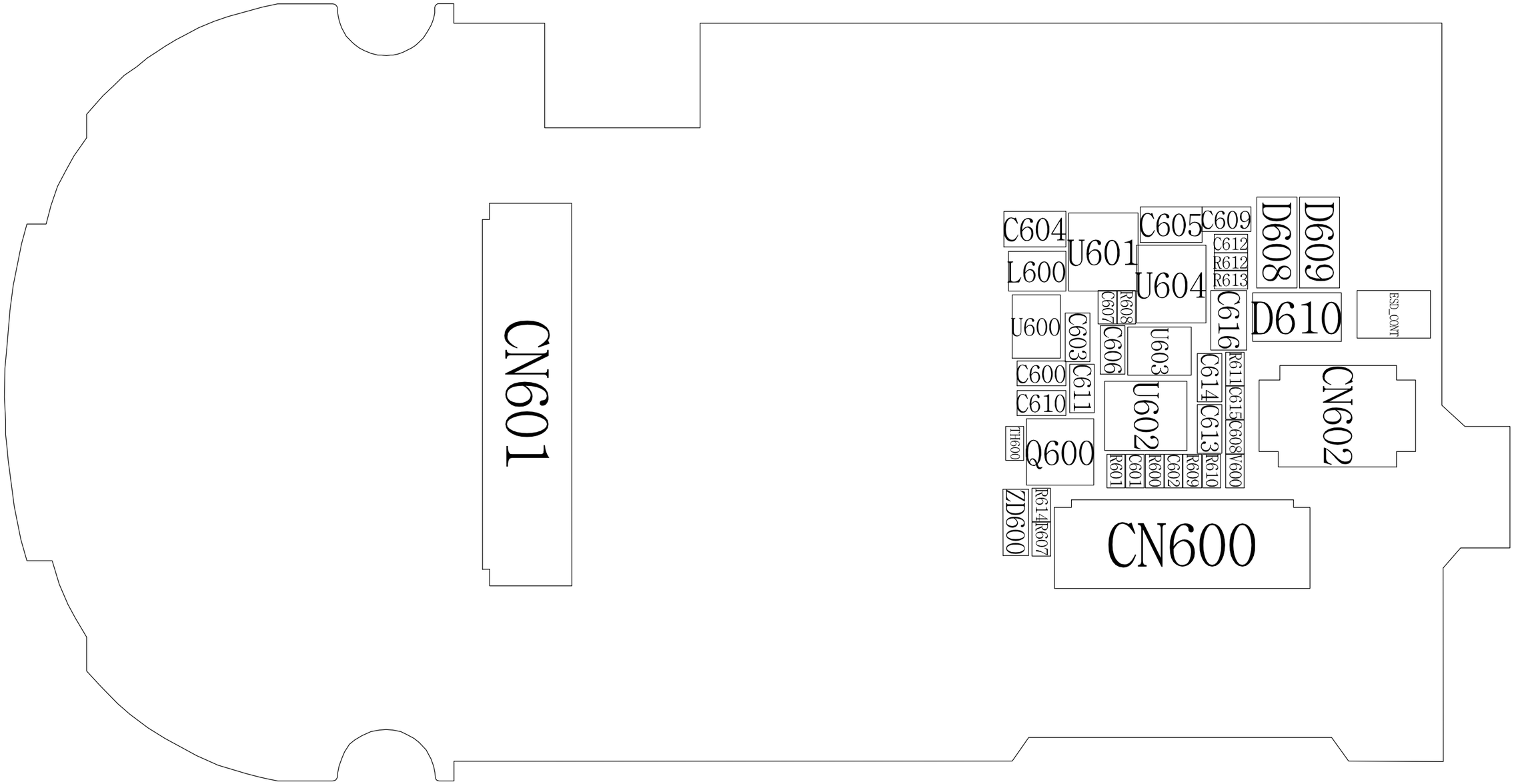
3. Sub PCB Top Diagram



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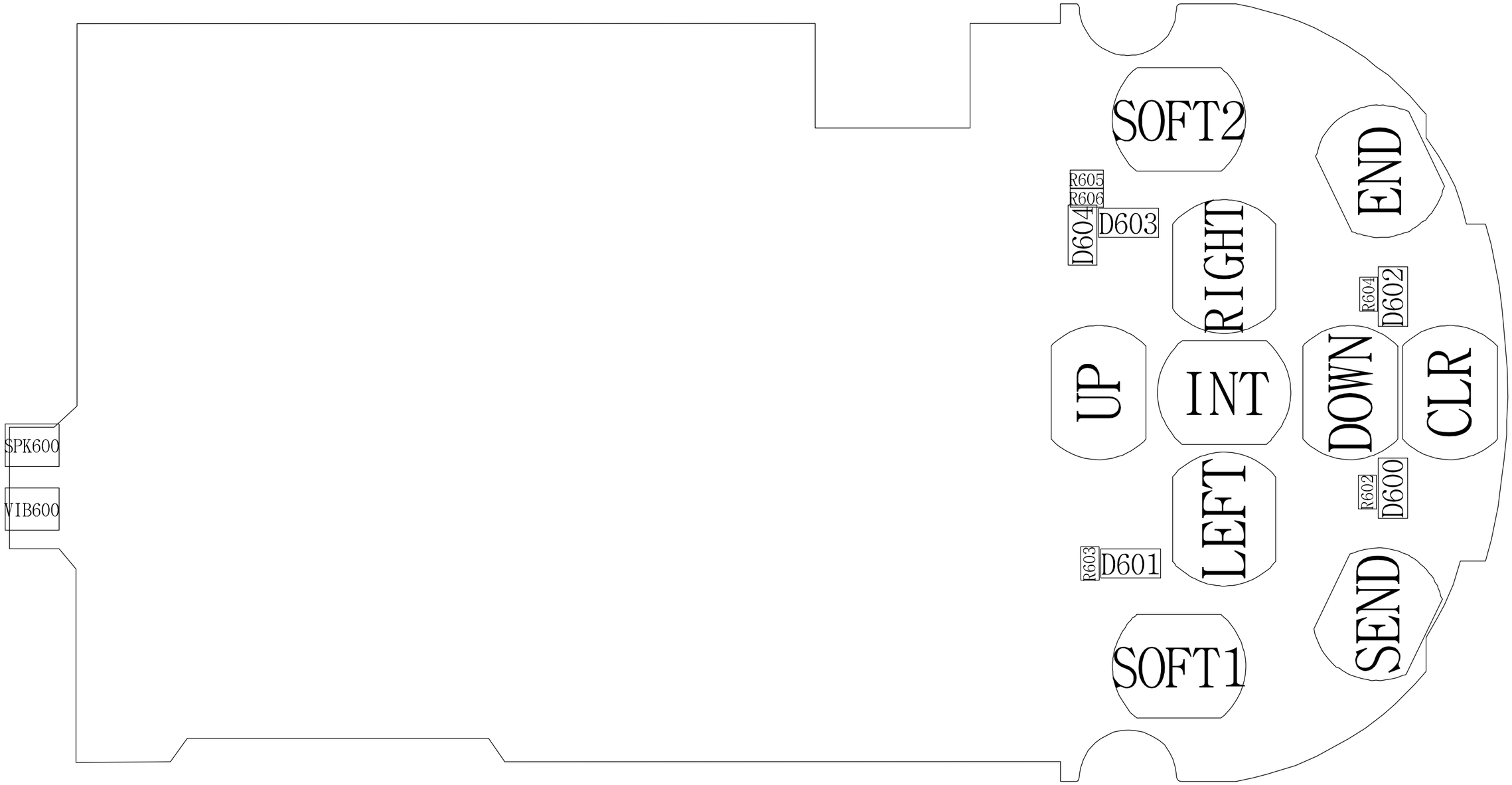
4. Sub PCB Bottom Diagram



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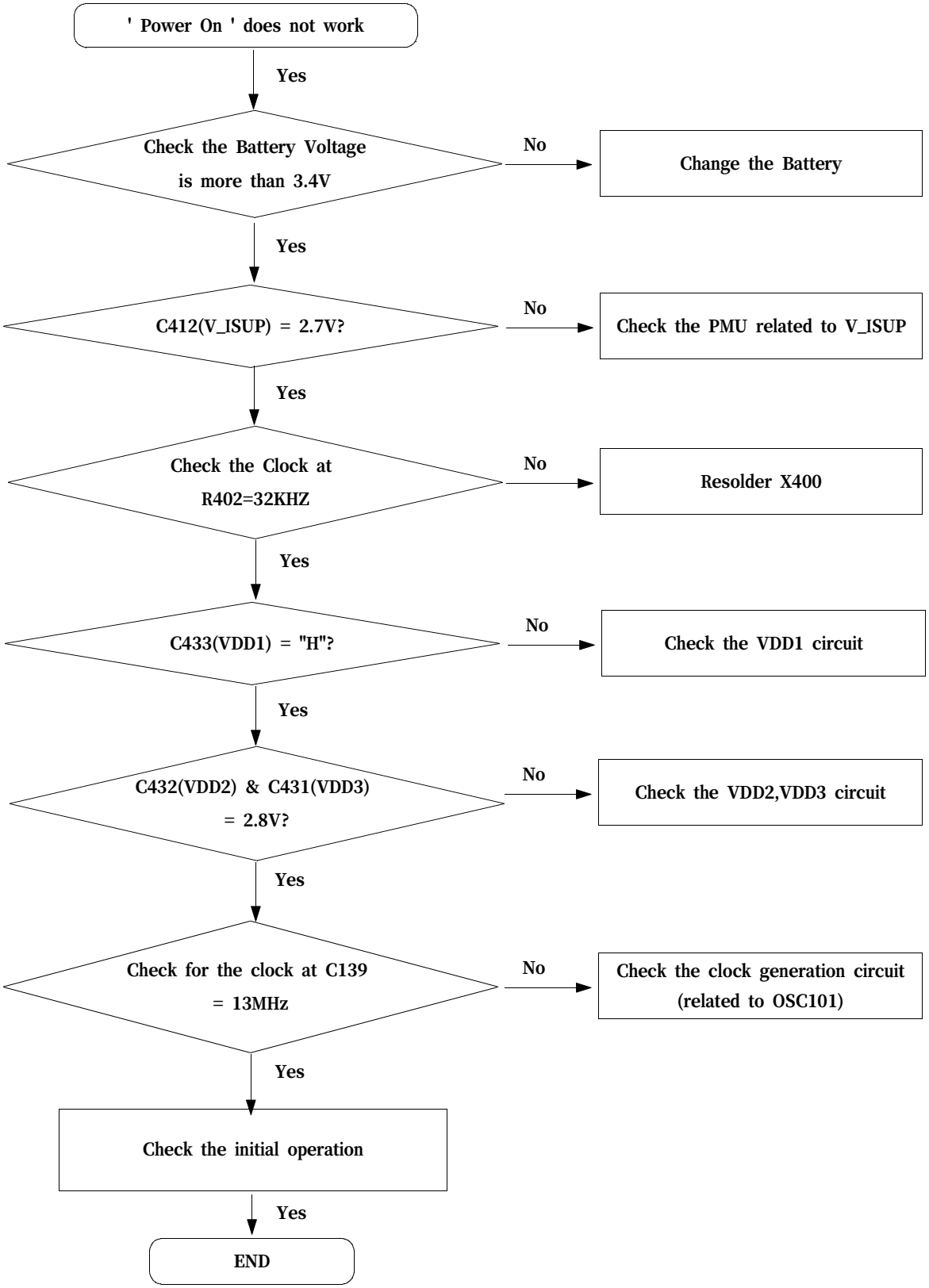
7. SGH-E800 Flow Chart of Troubleshooting

1. Power On



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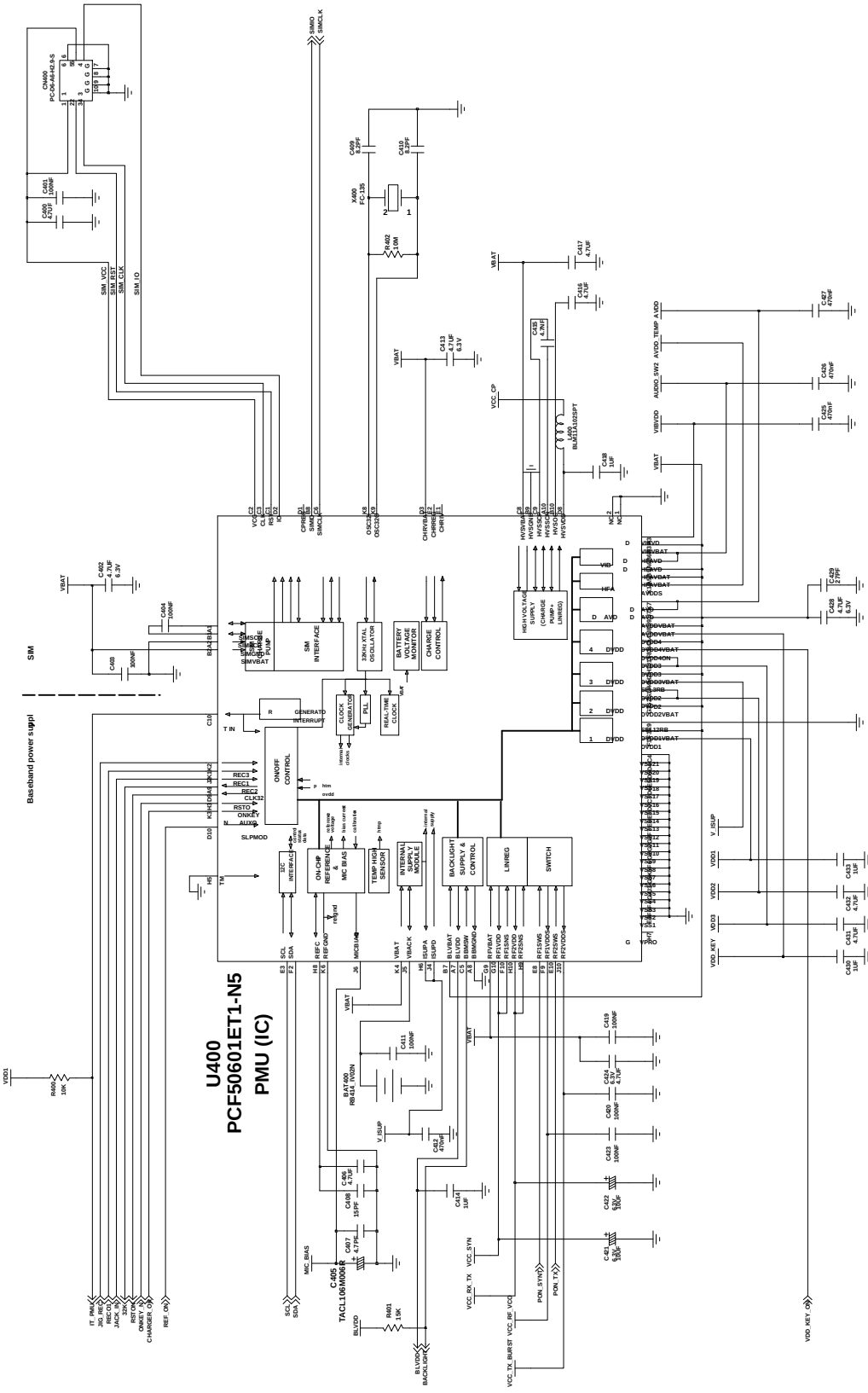

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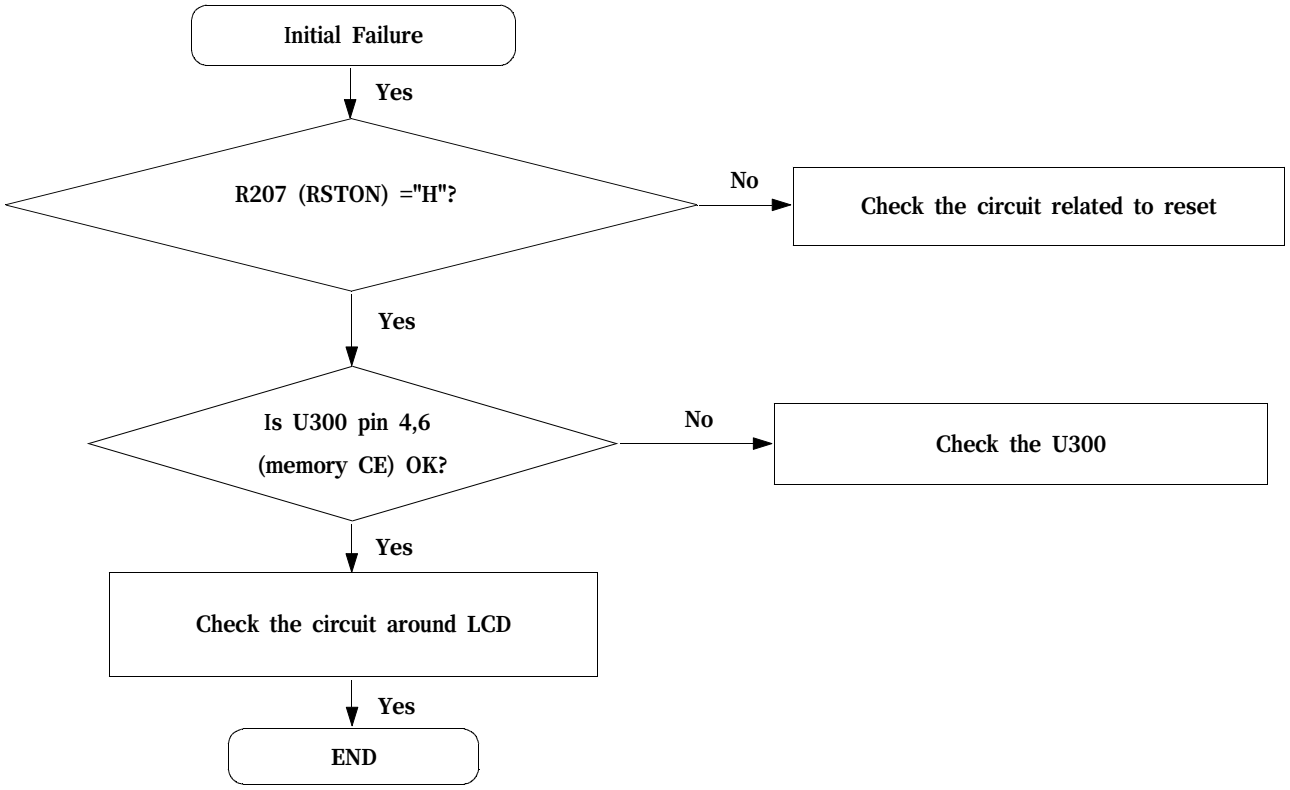
2. Initial



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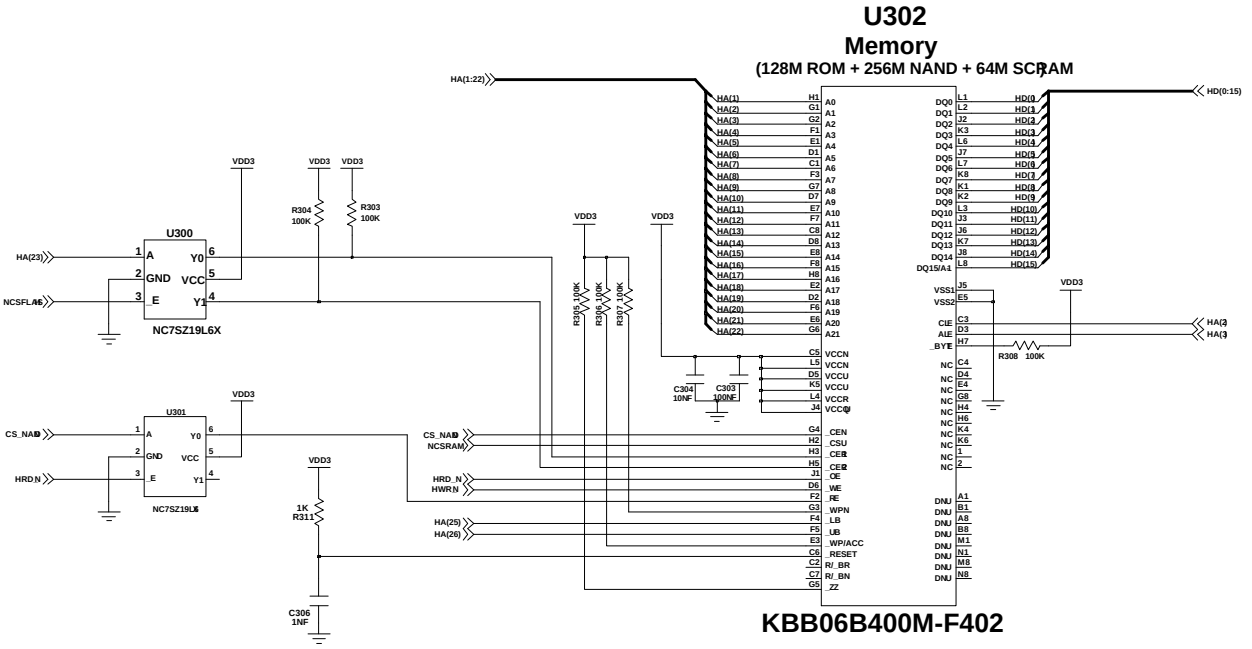

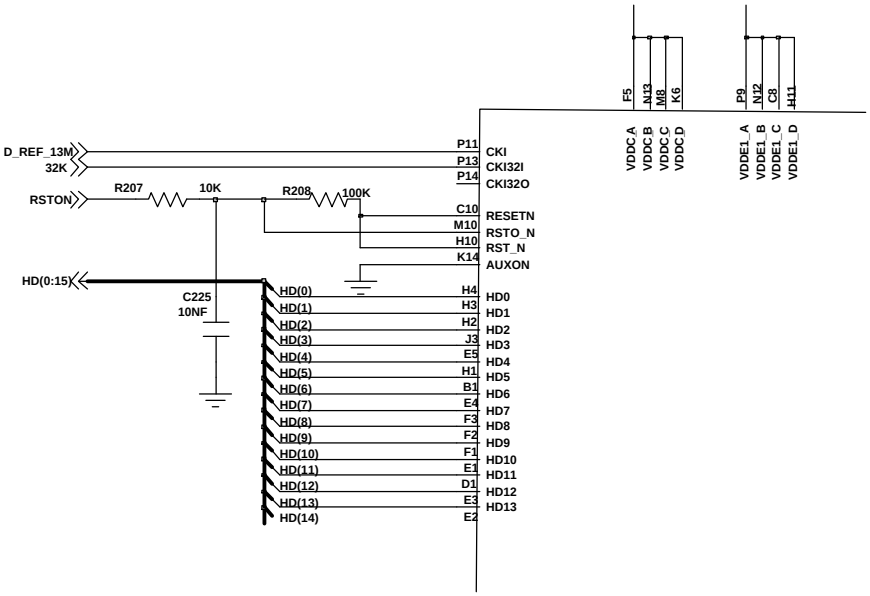

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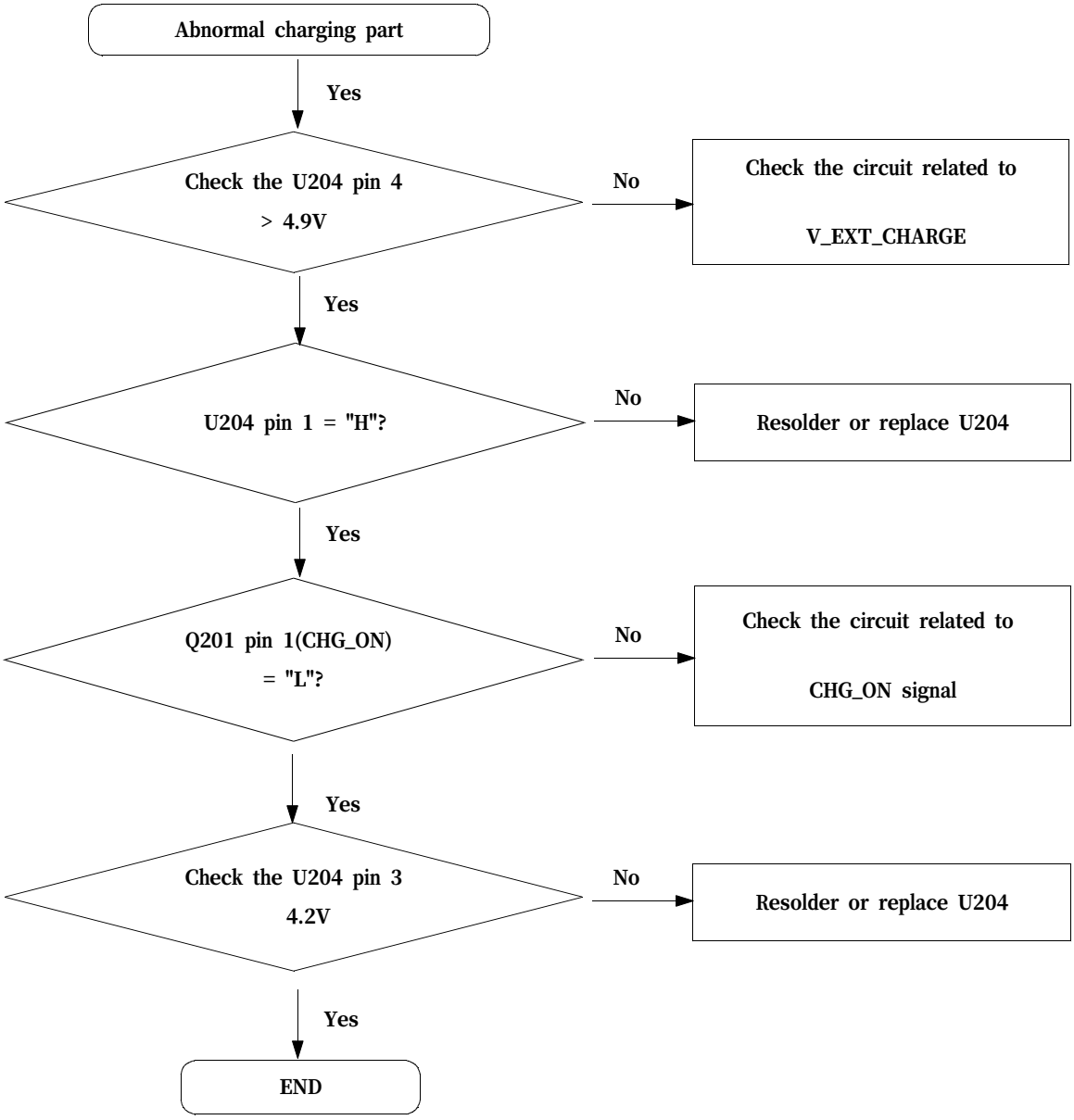
3. Charging Part



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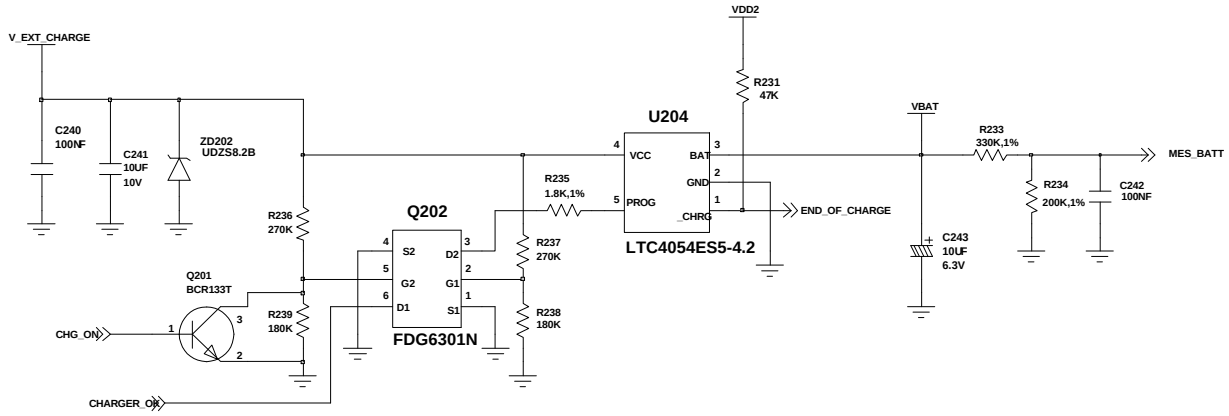

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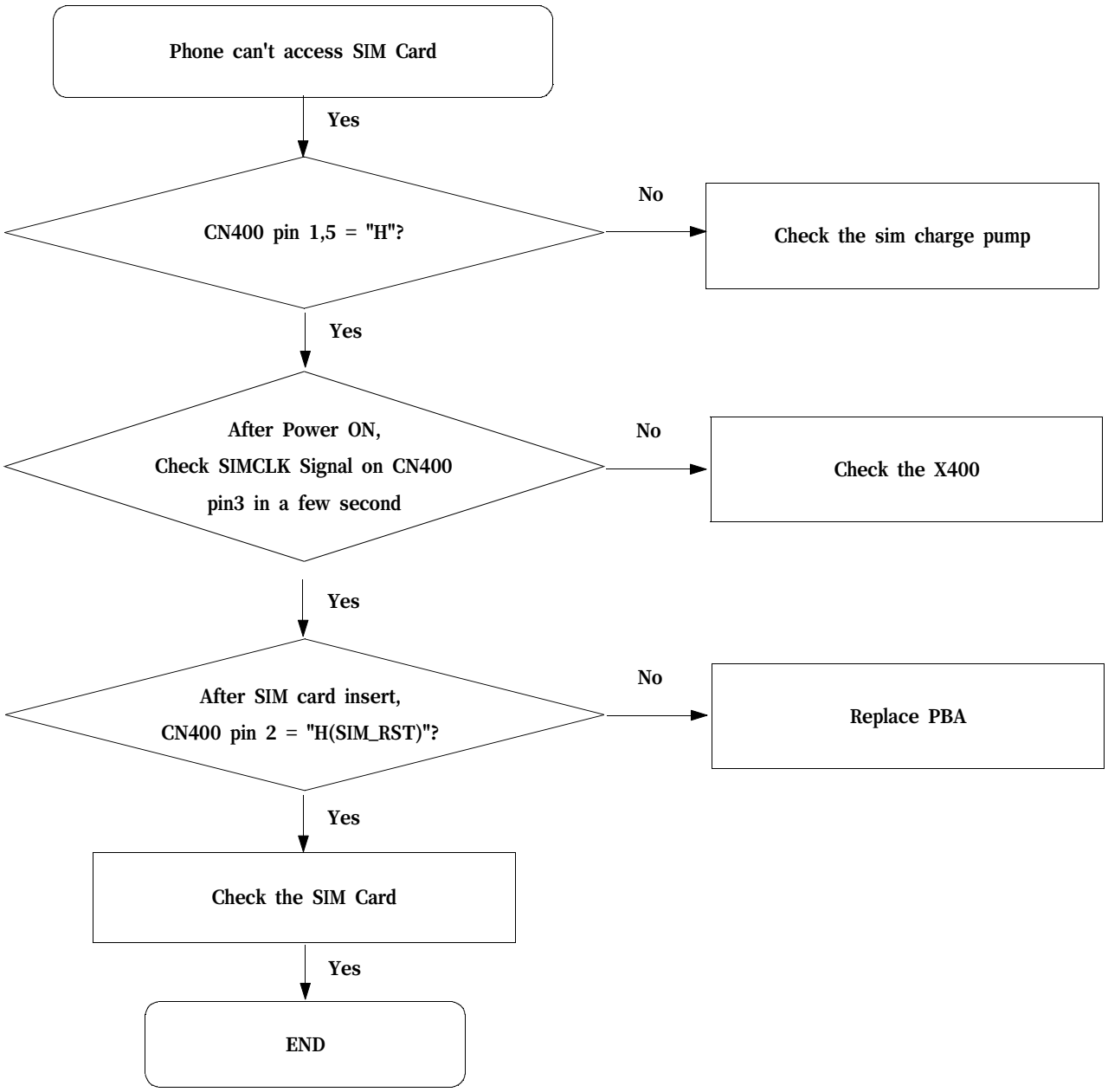
4. Sim Part



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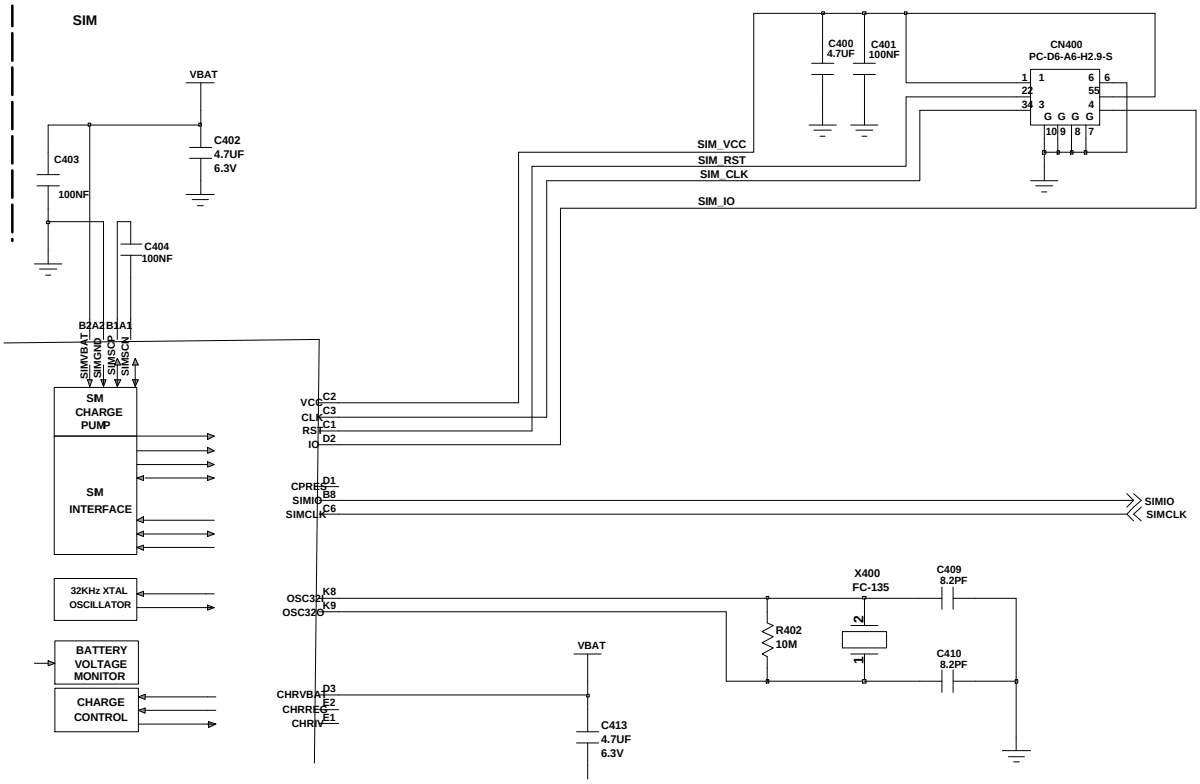

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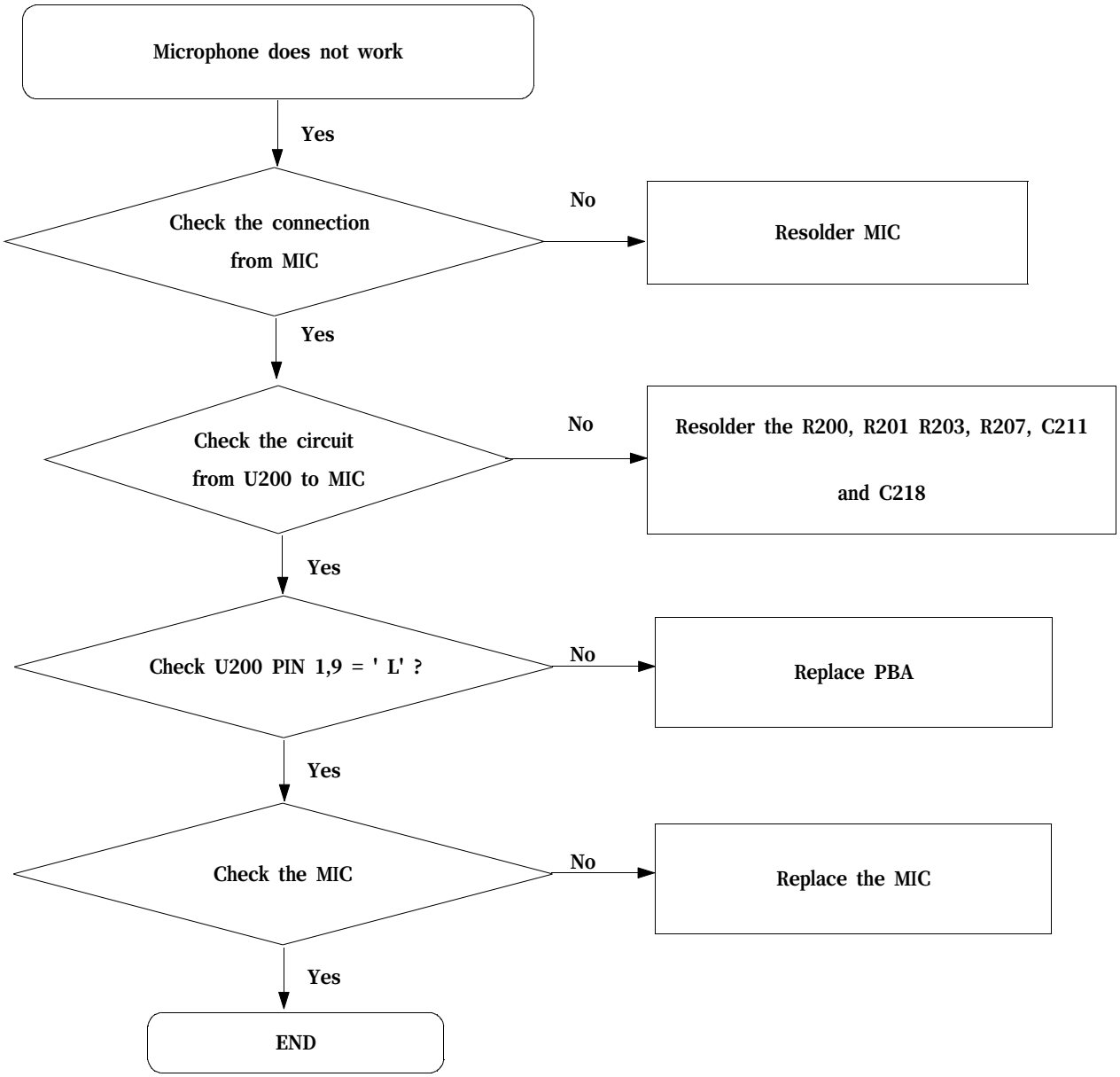
5. Microphone Part



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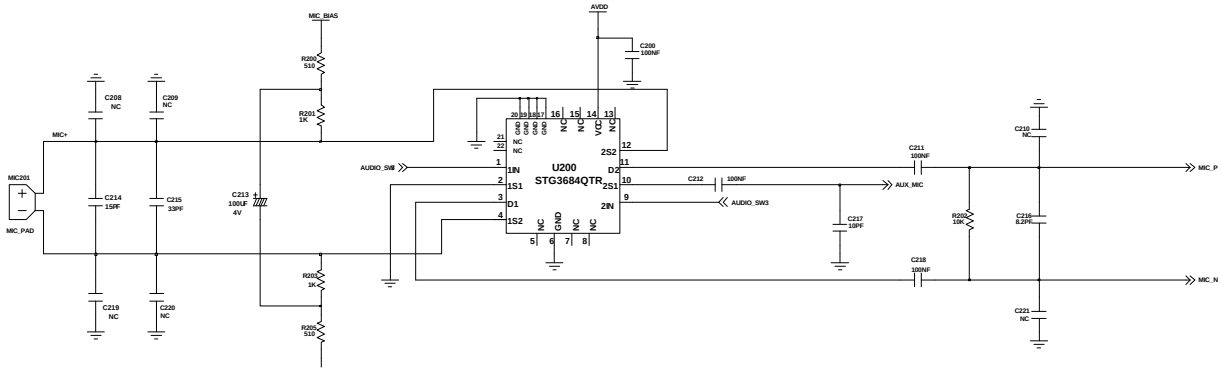

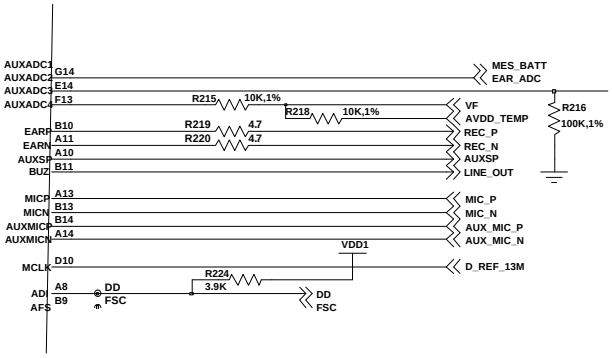

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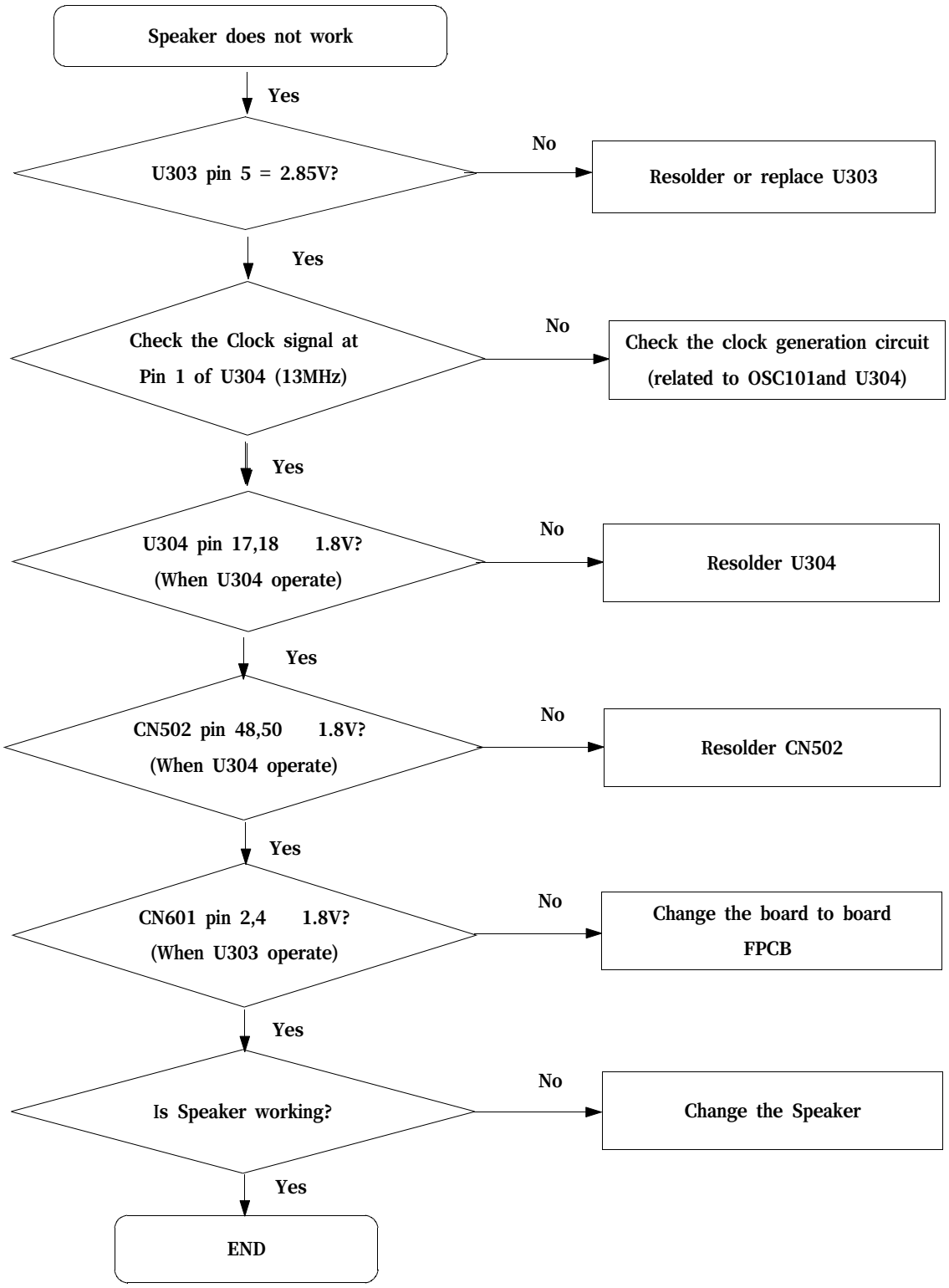
6. Speaker Part(Melody)



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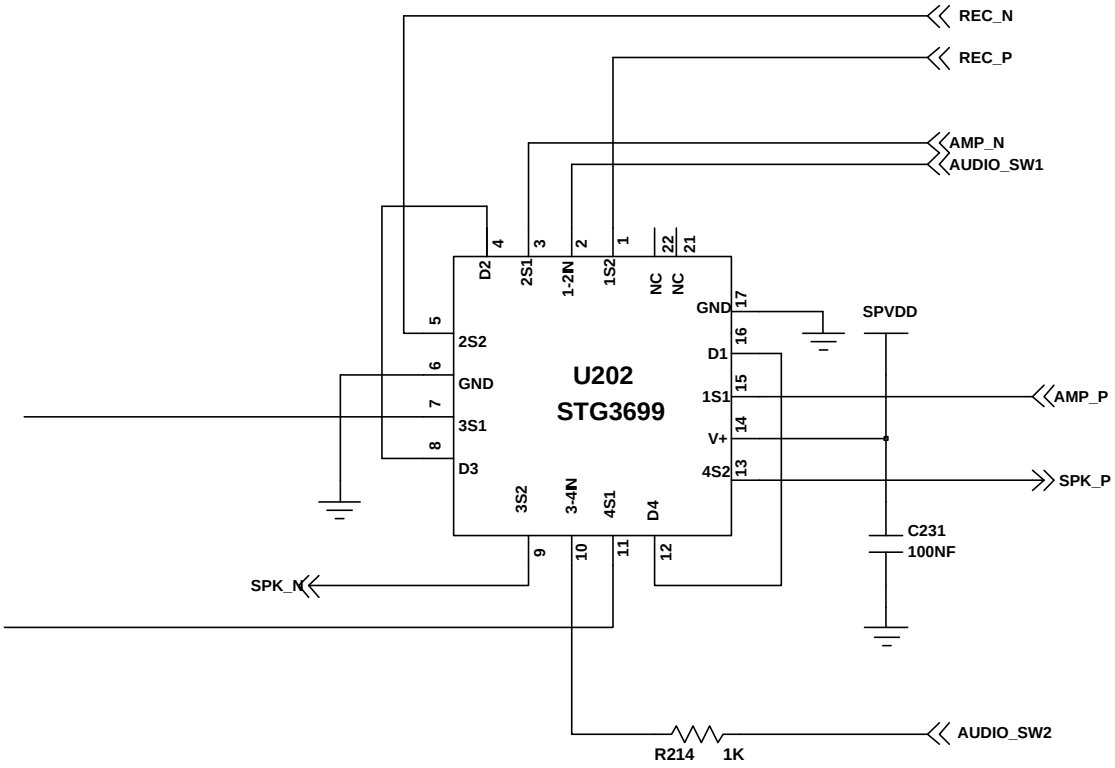

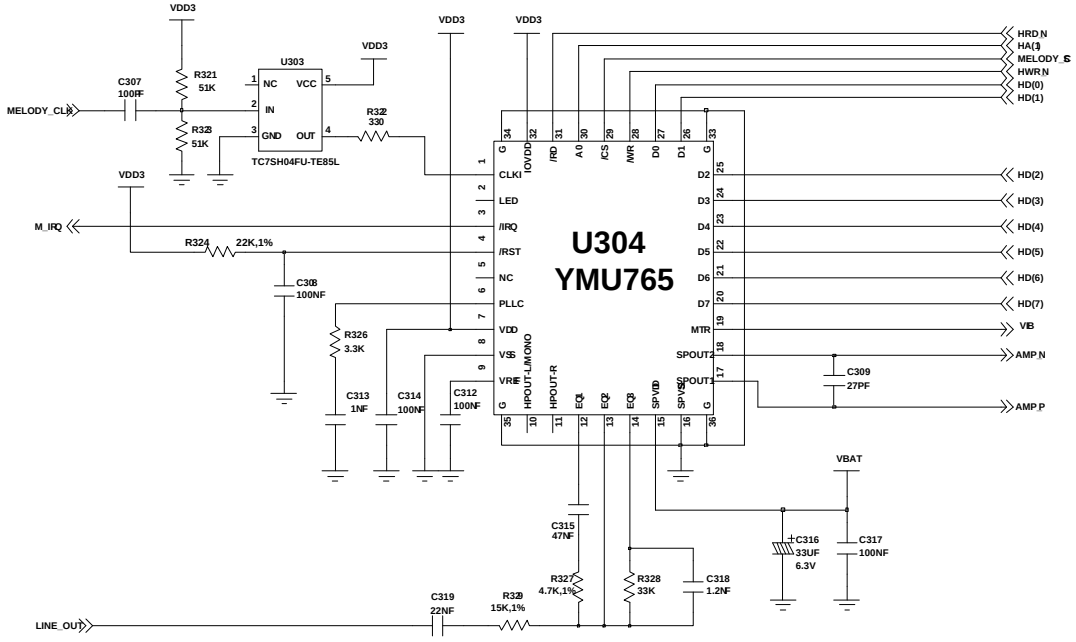

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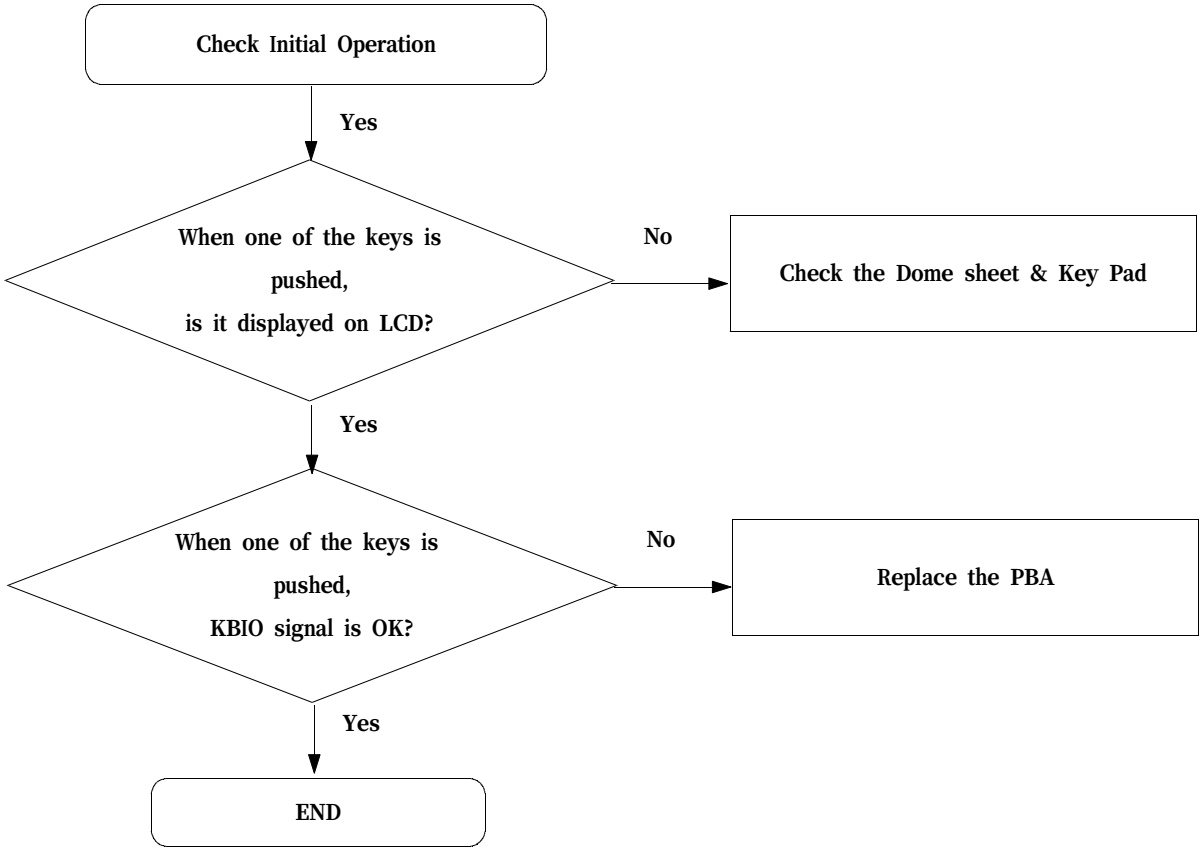
7. Key Data Input



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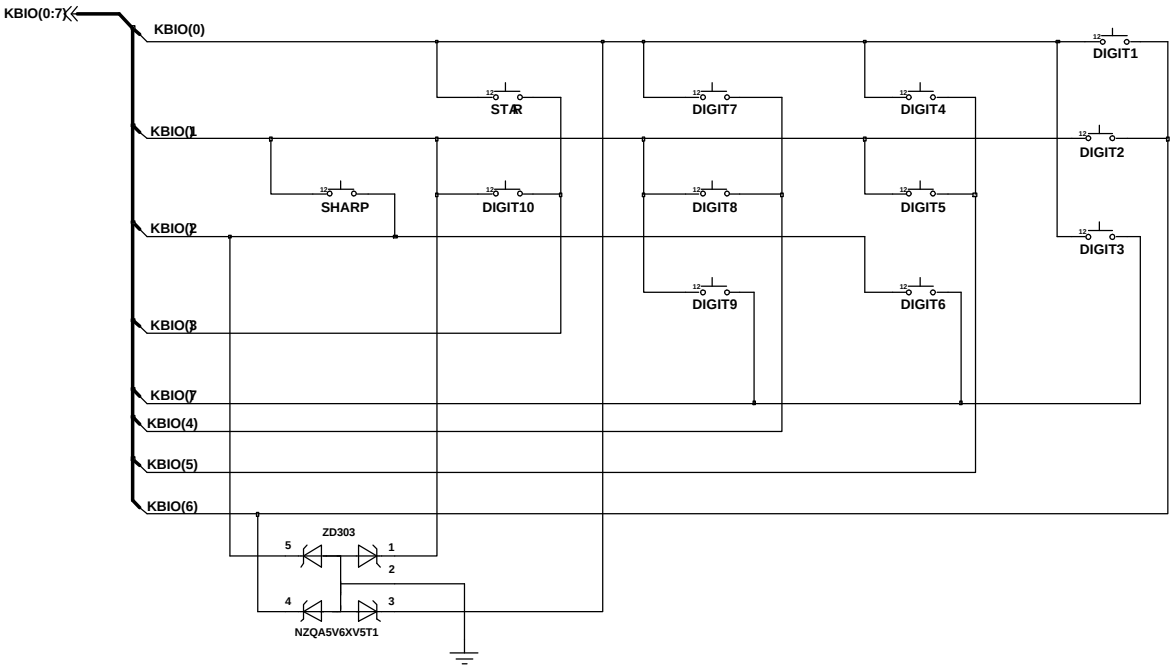

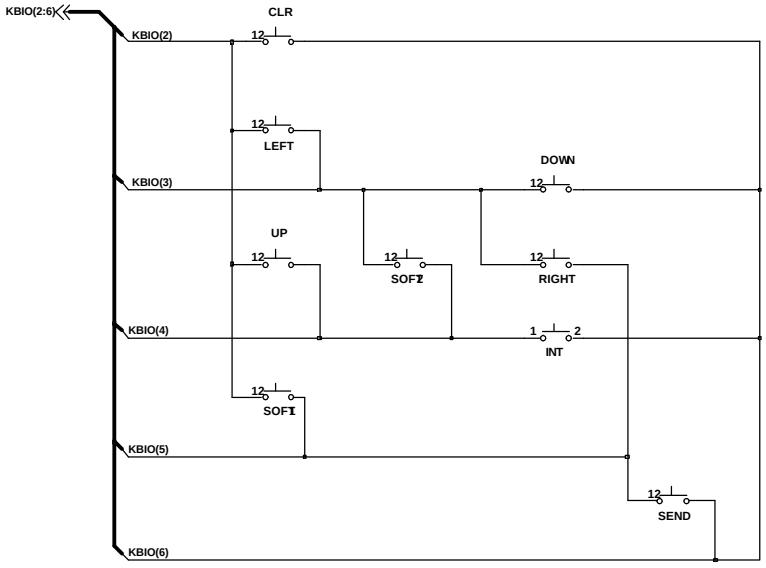

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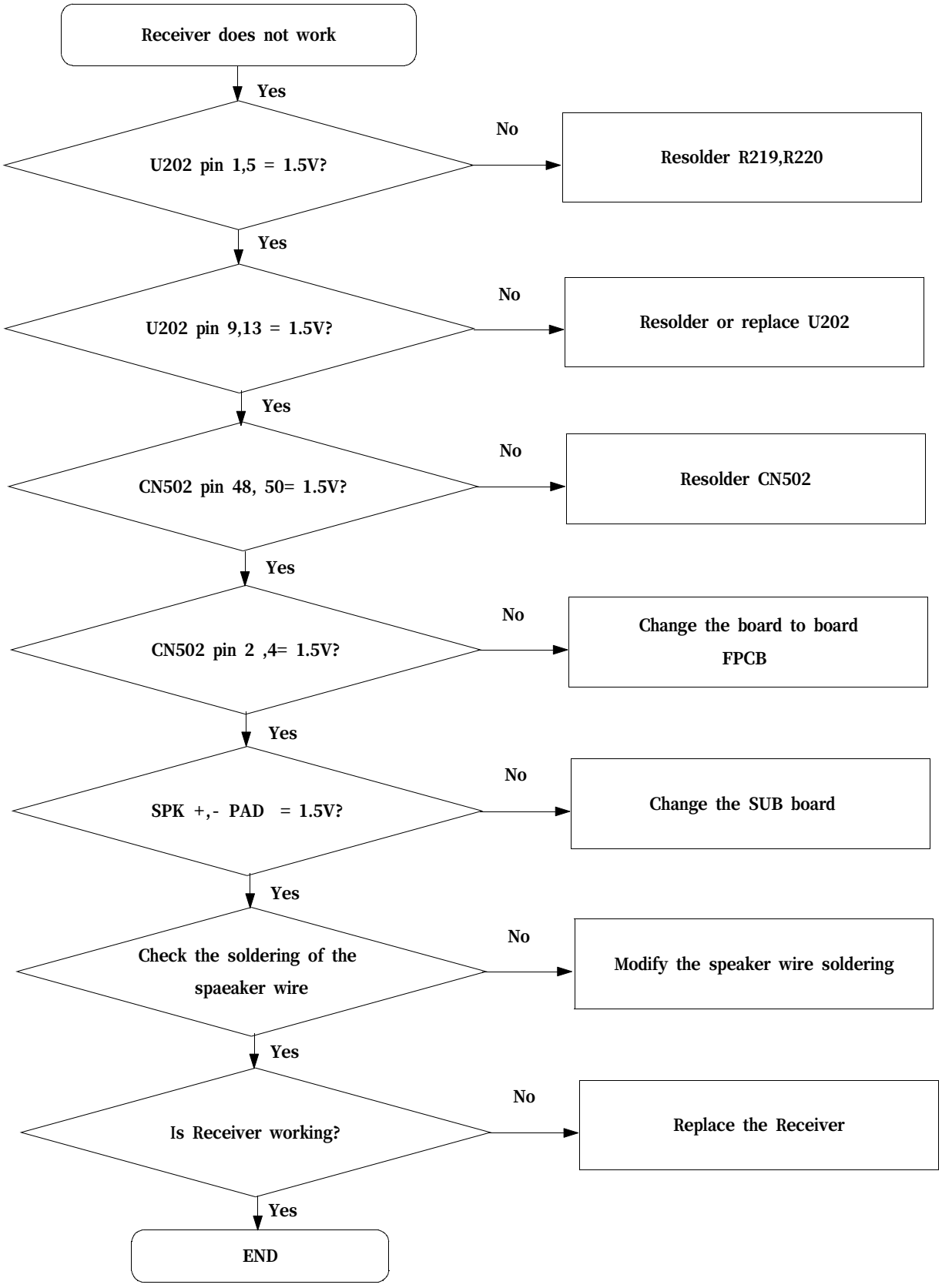
8. Receiver Part



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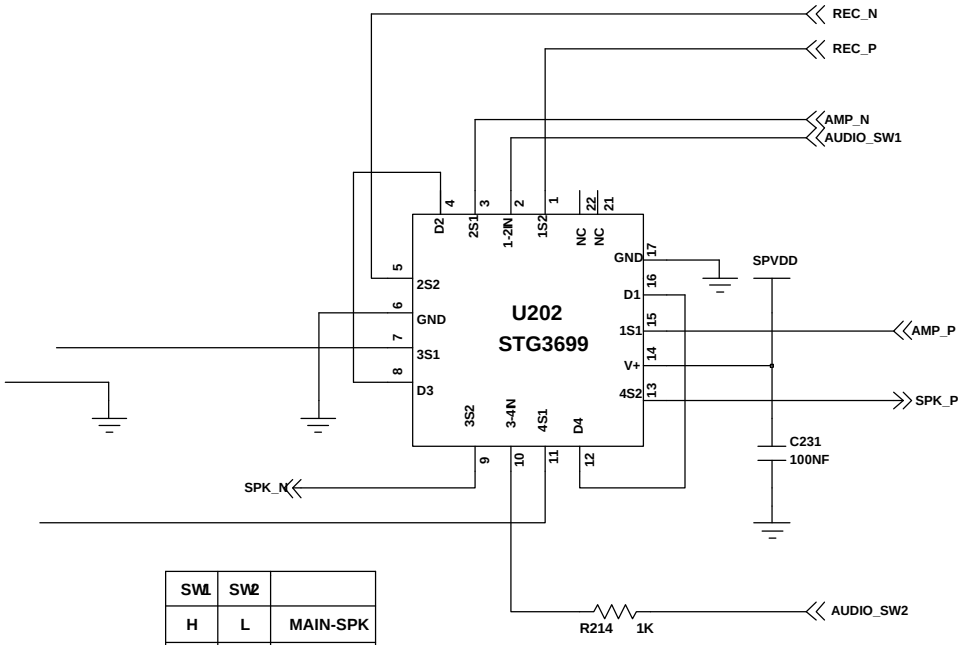
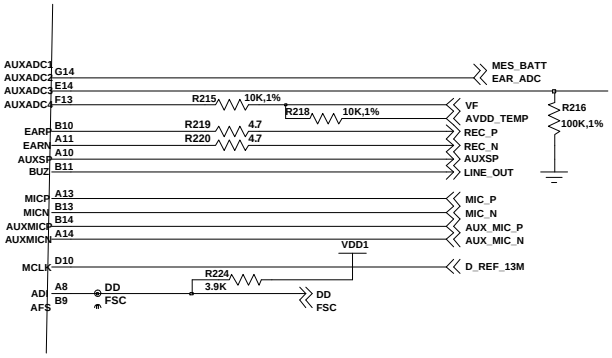


SW1	SW2	
H	L	MAIN-SPK
L	L	MAIN-REC
H	H	EAR-SPK
L	H	EAR-REC



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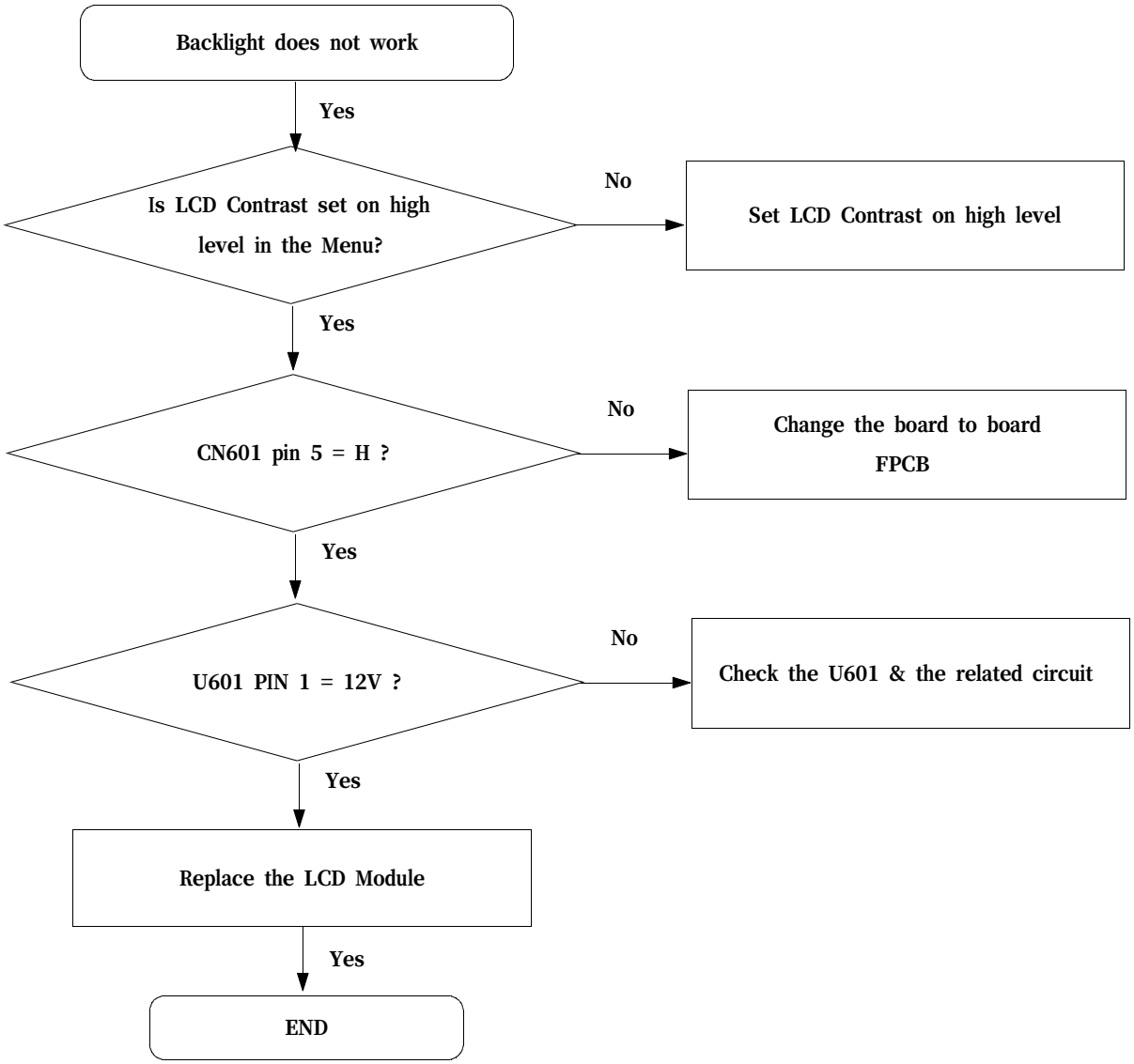
9. Back Light (for Color Main LCD)



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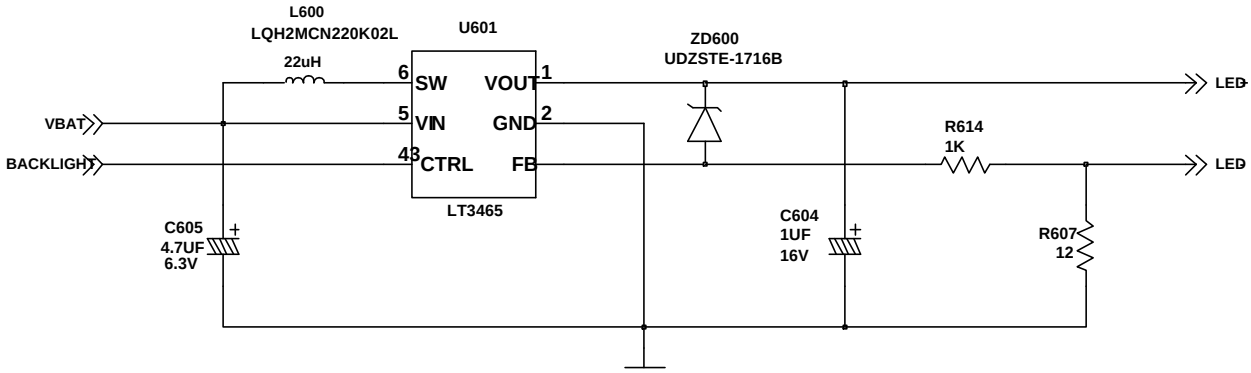

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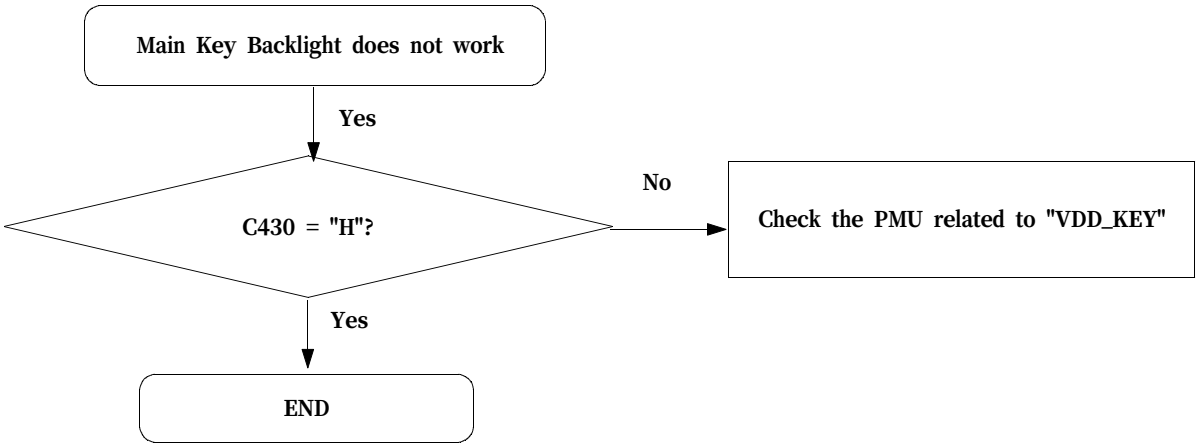
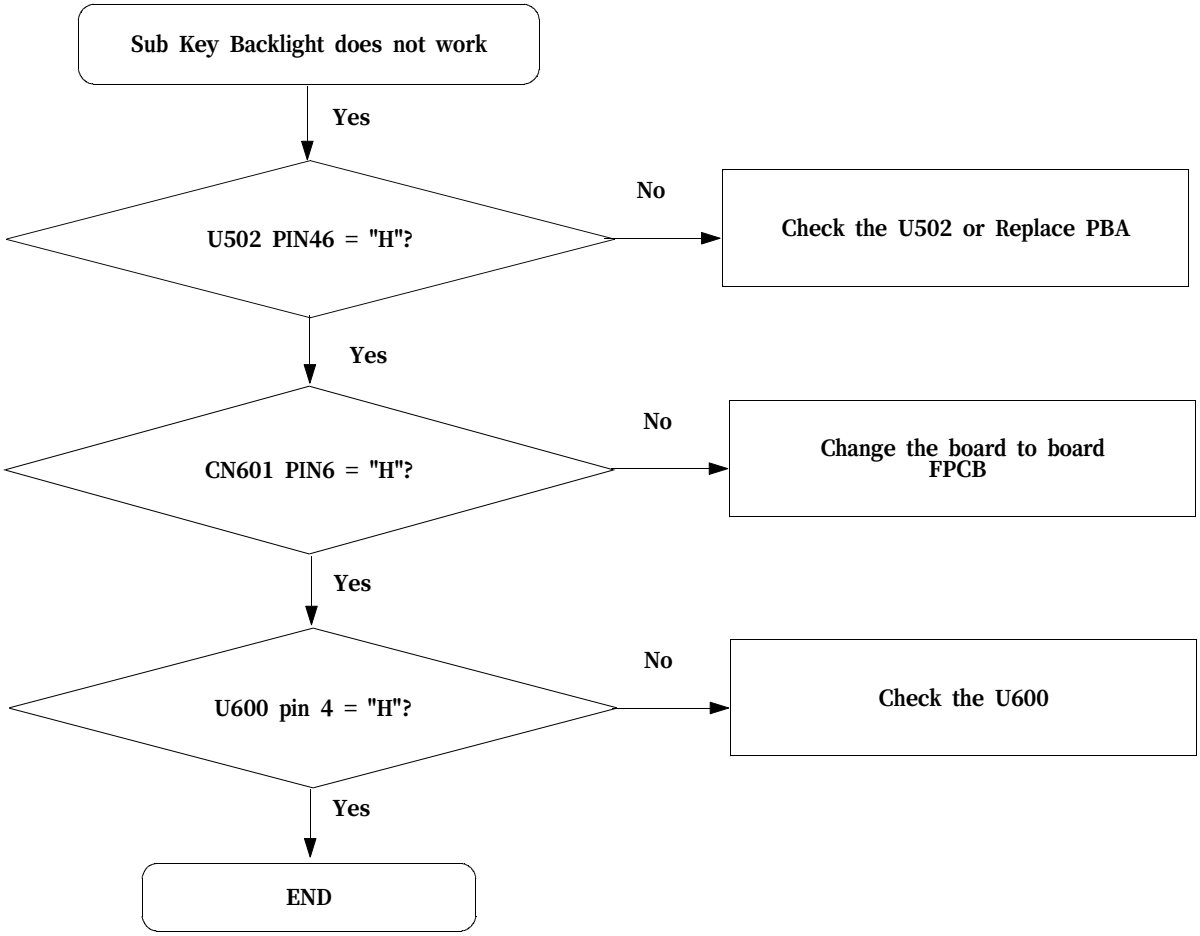
10. Key Back Light

1) Main Key Part



2) Sub Key Part



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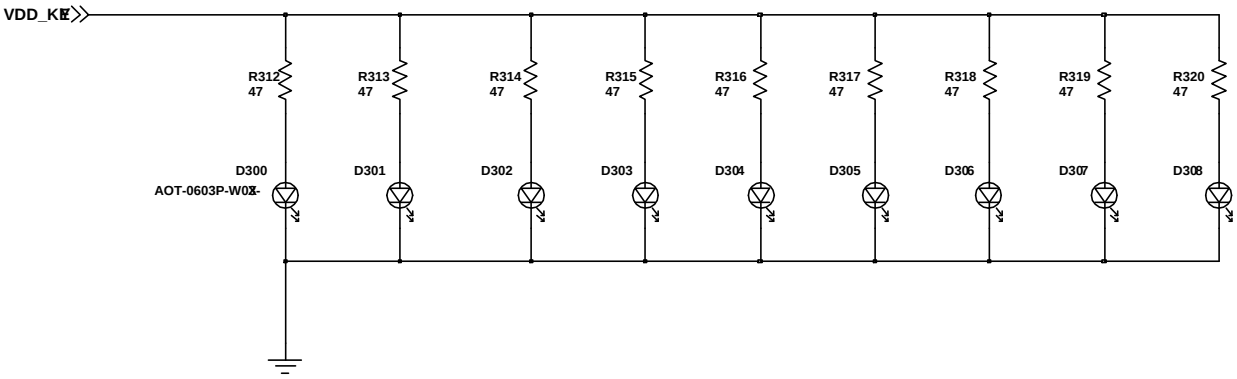

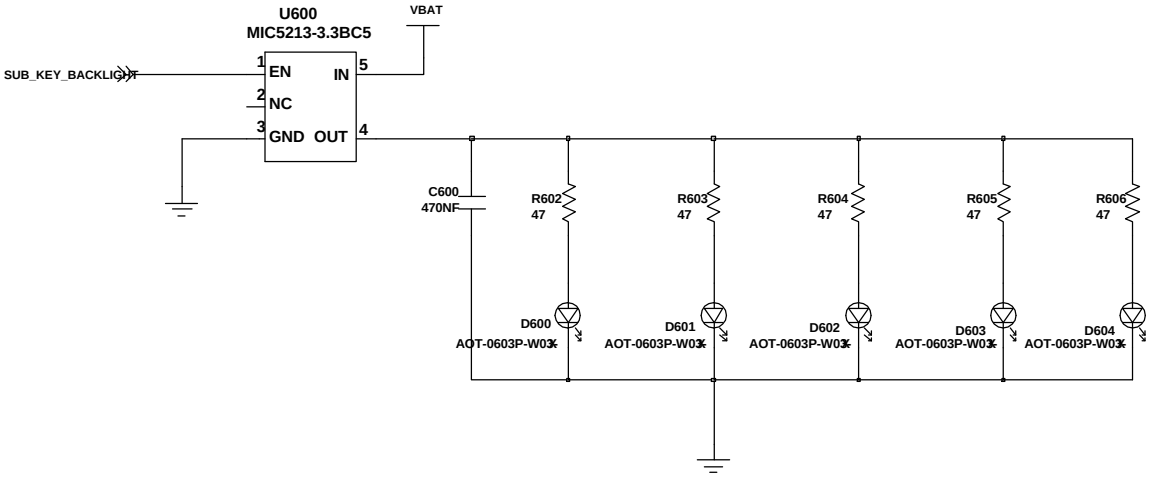

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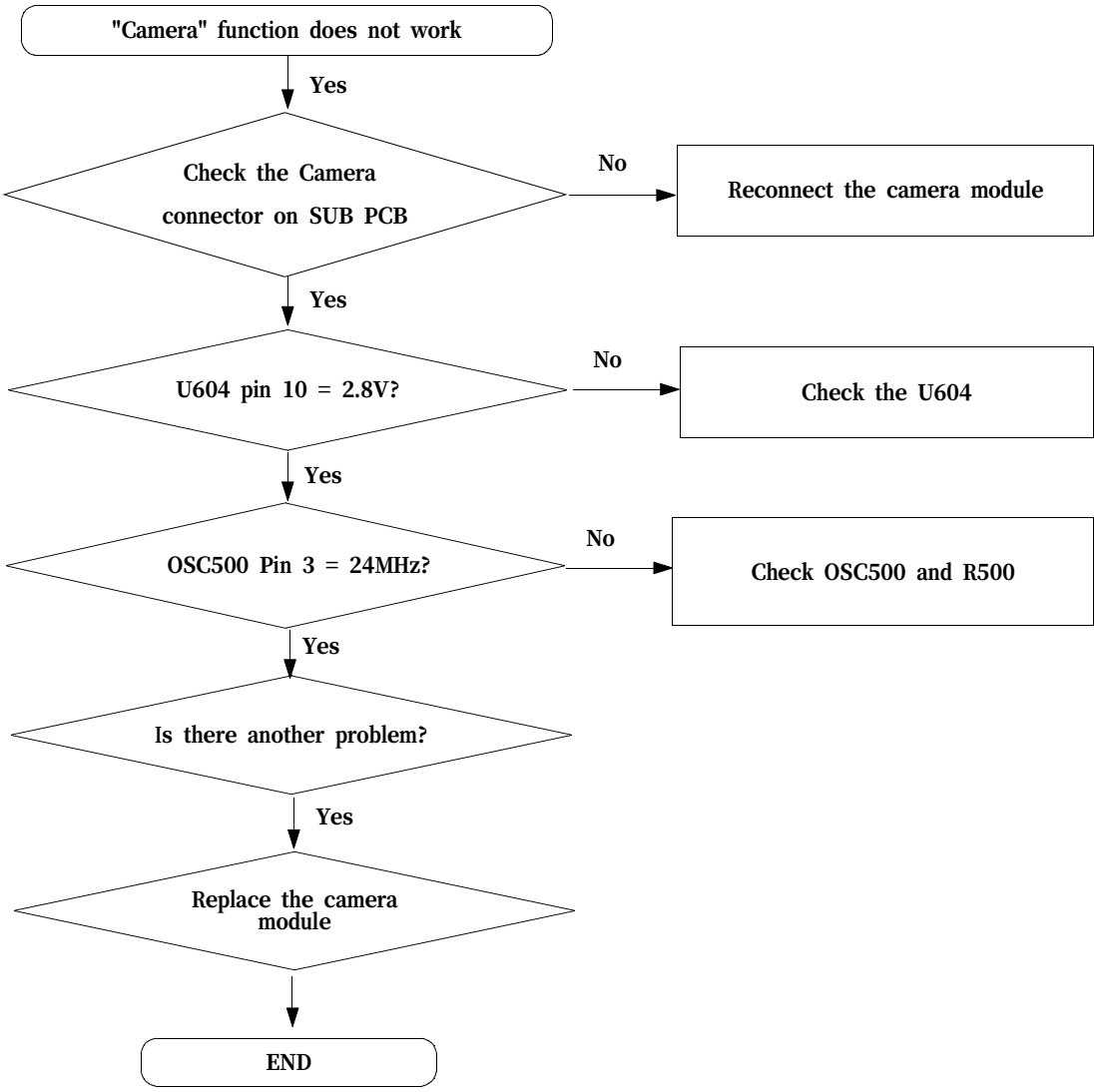
11. Camera part



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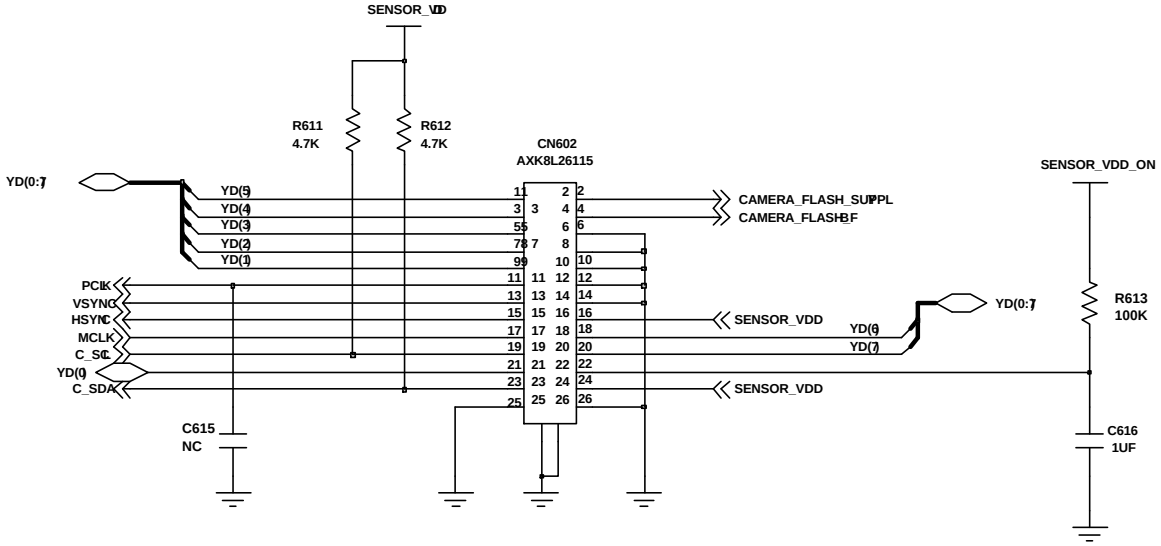
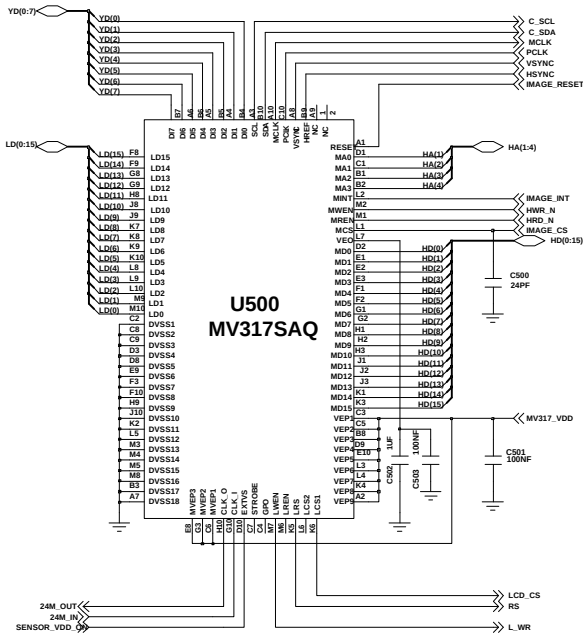
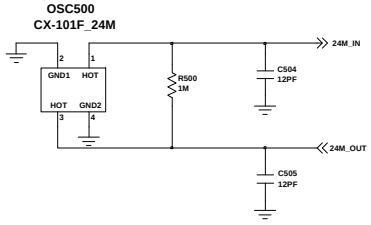


CAMERA_Connector





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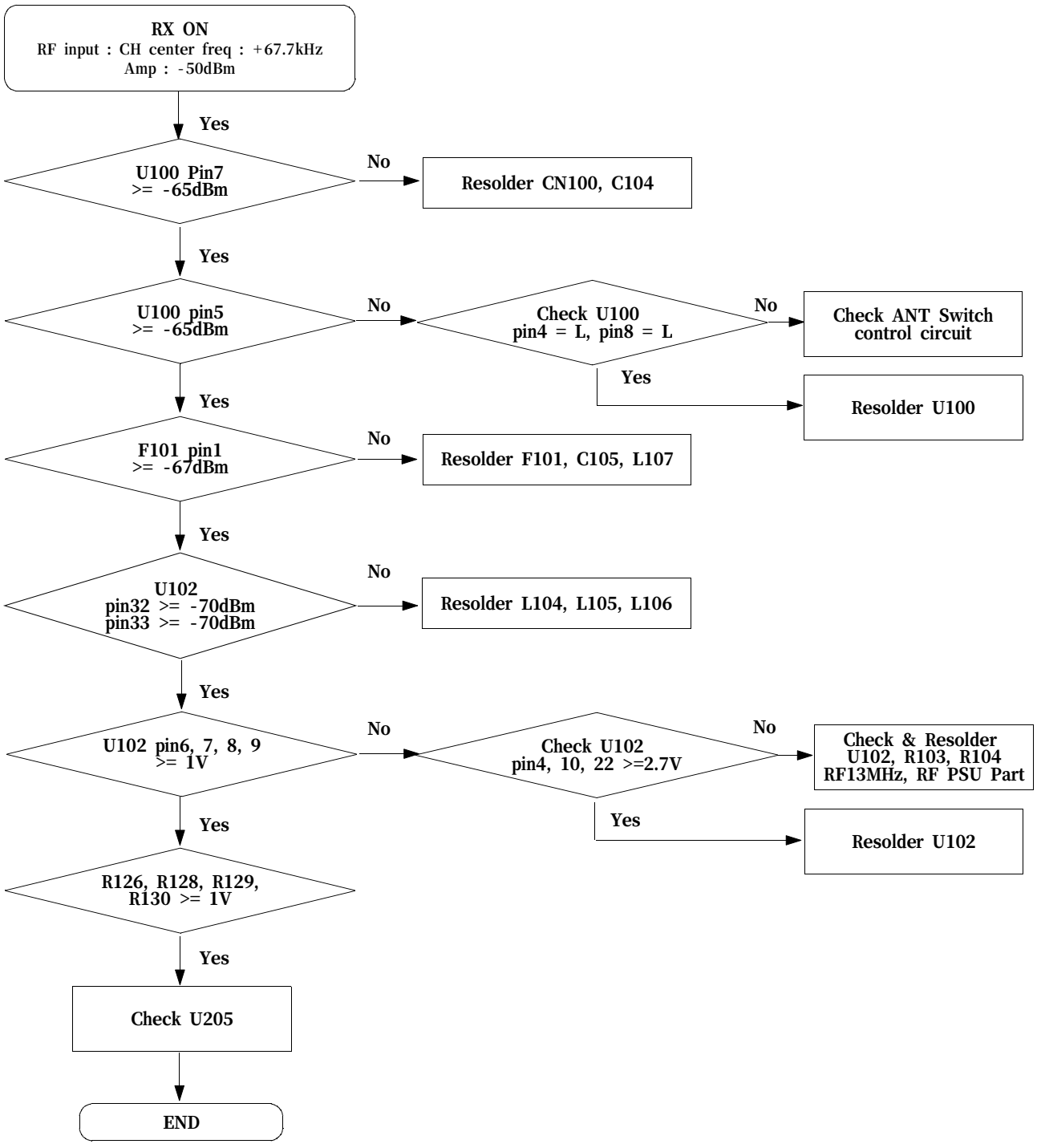
12. GSM Receiver



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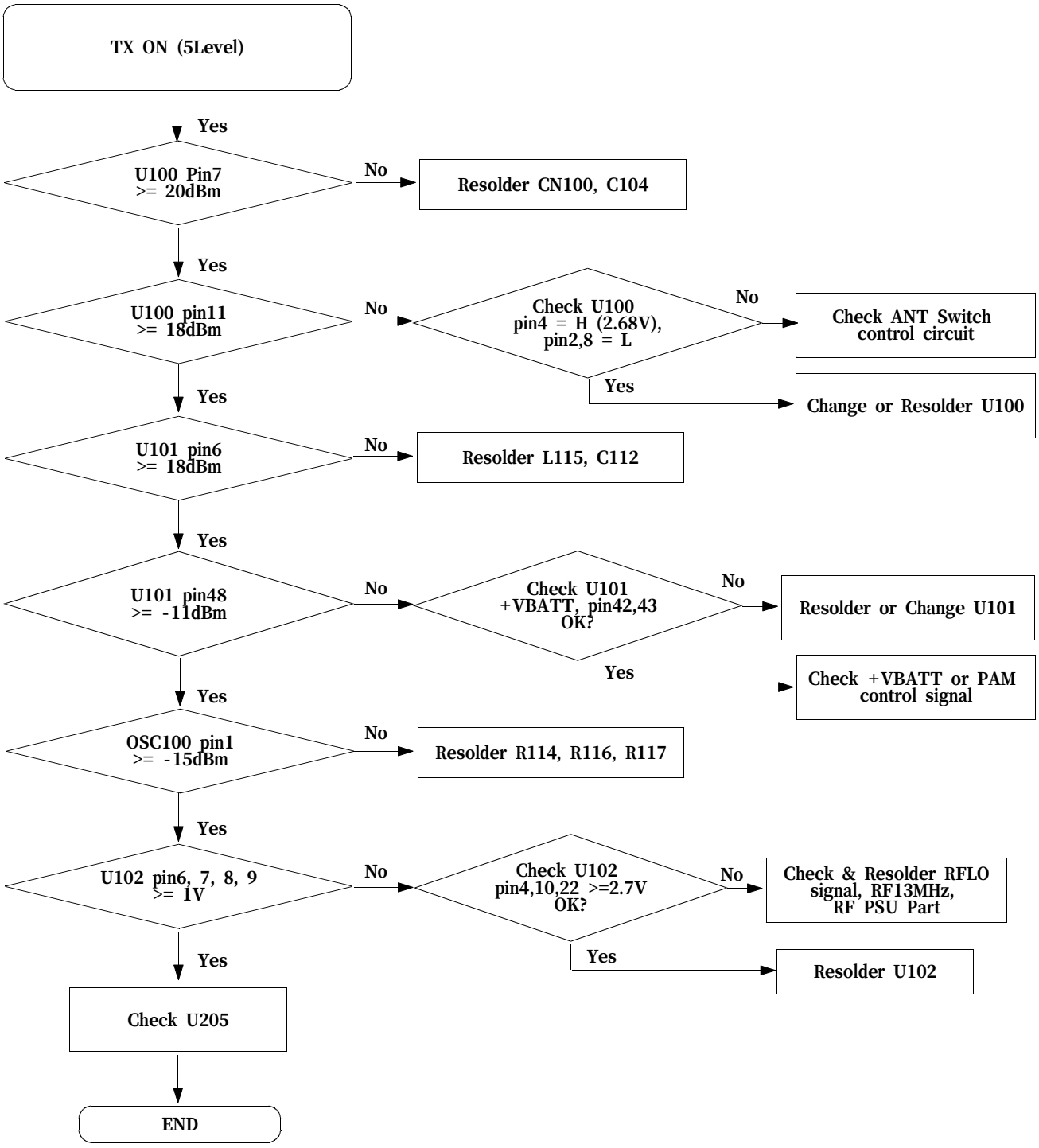
13. GSM Transmitter



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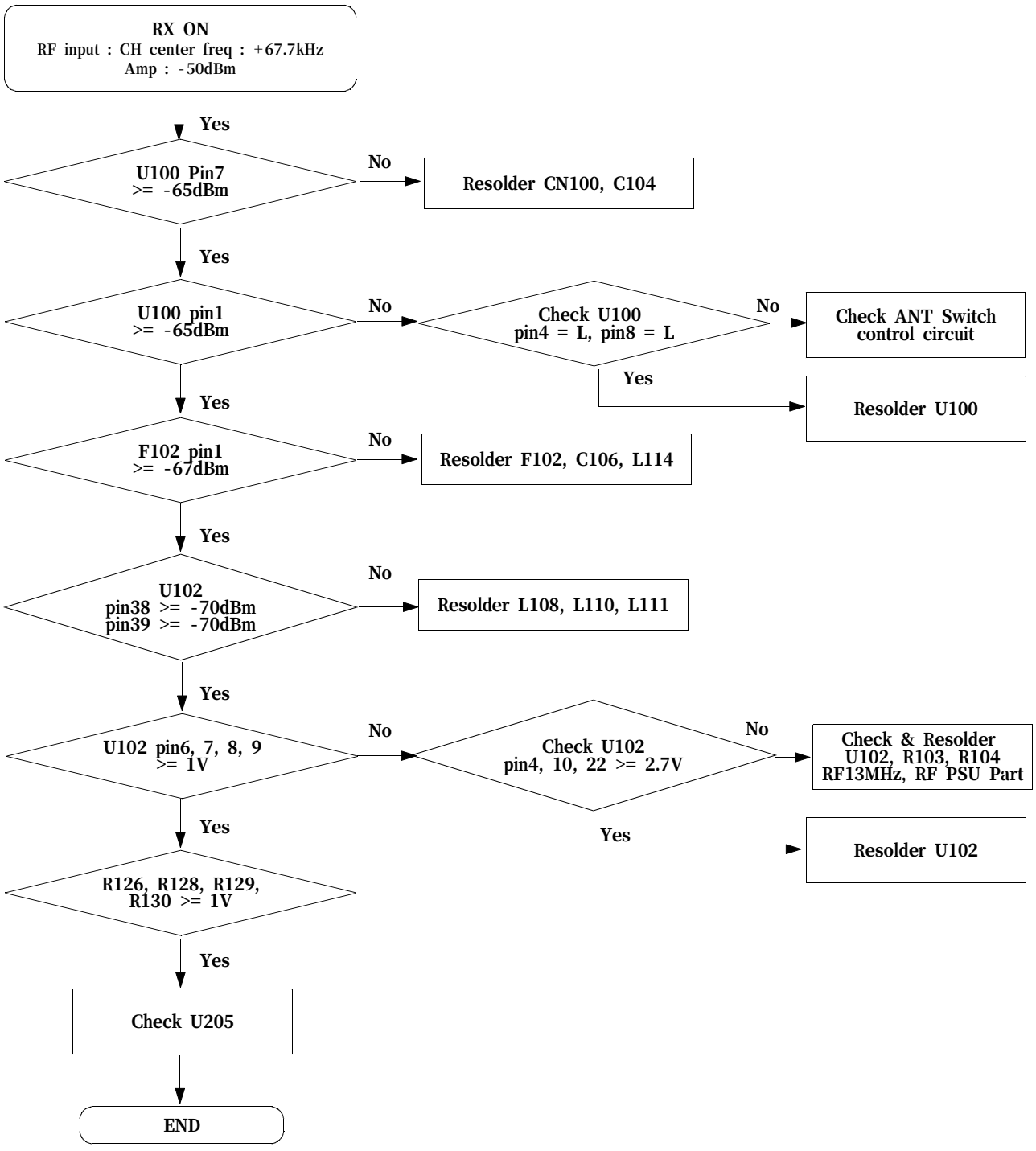
14. DCS Receiver



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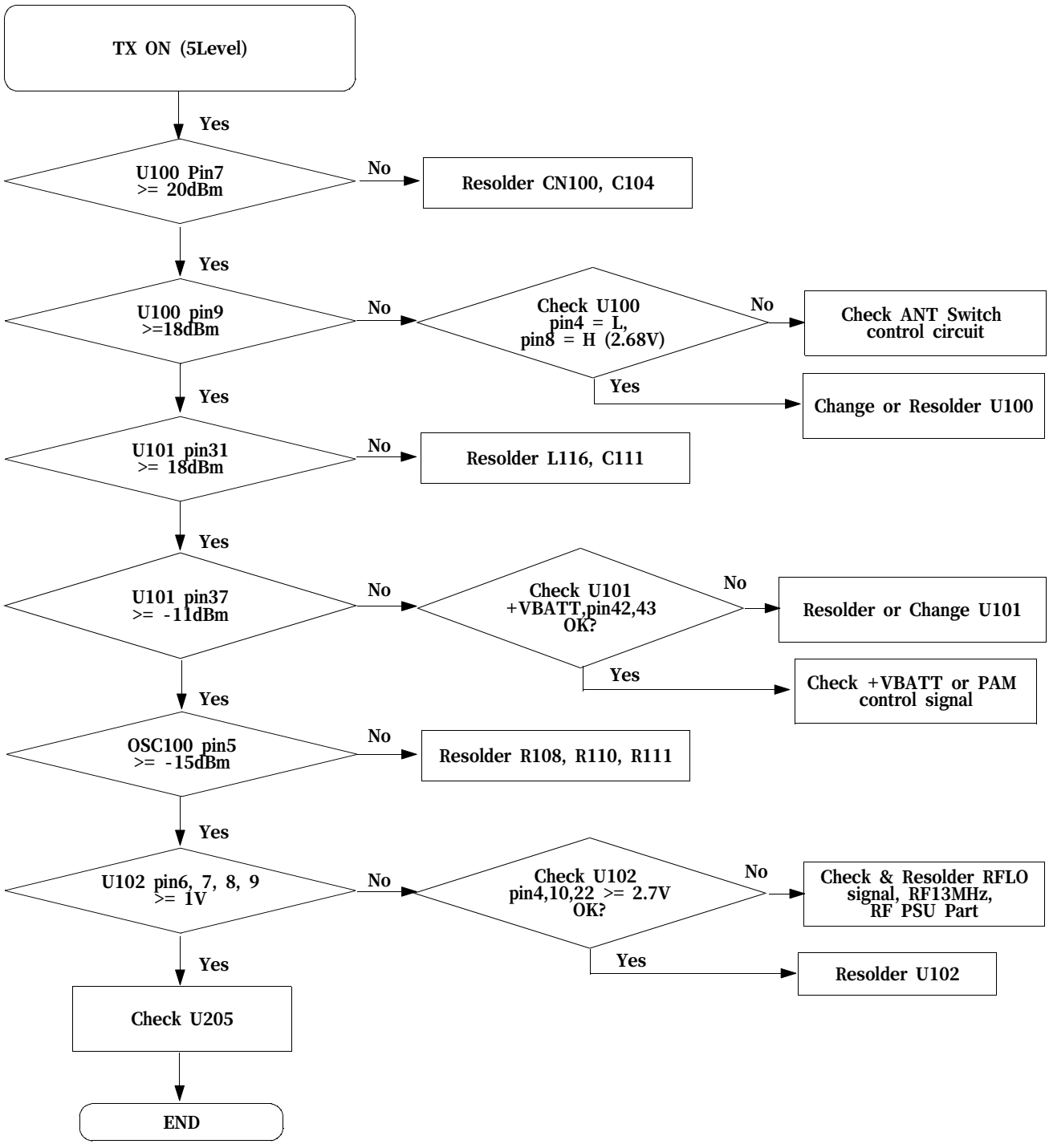
15. DCS Transmitter



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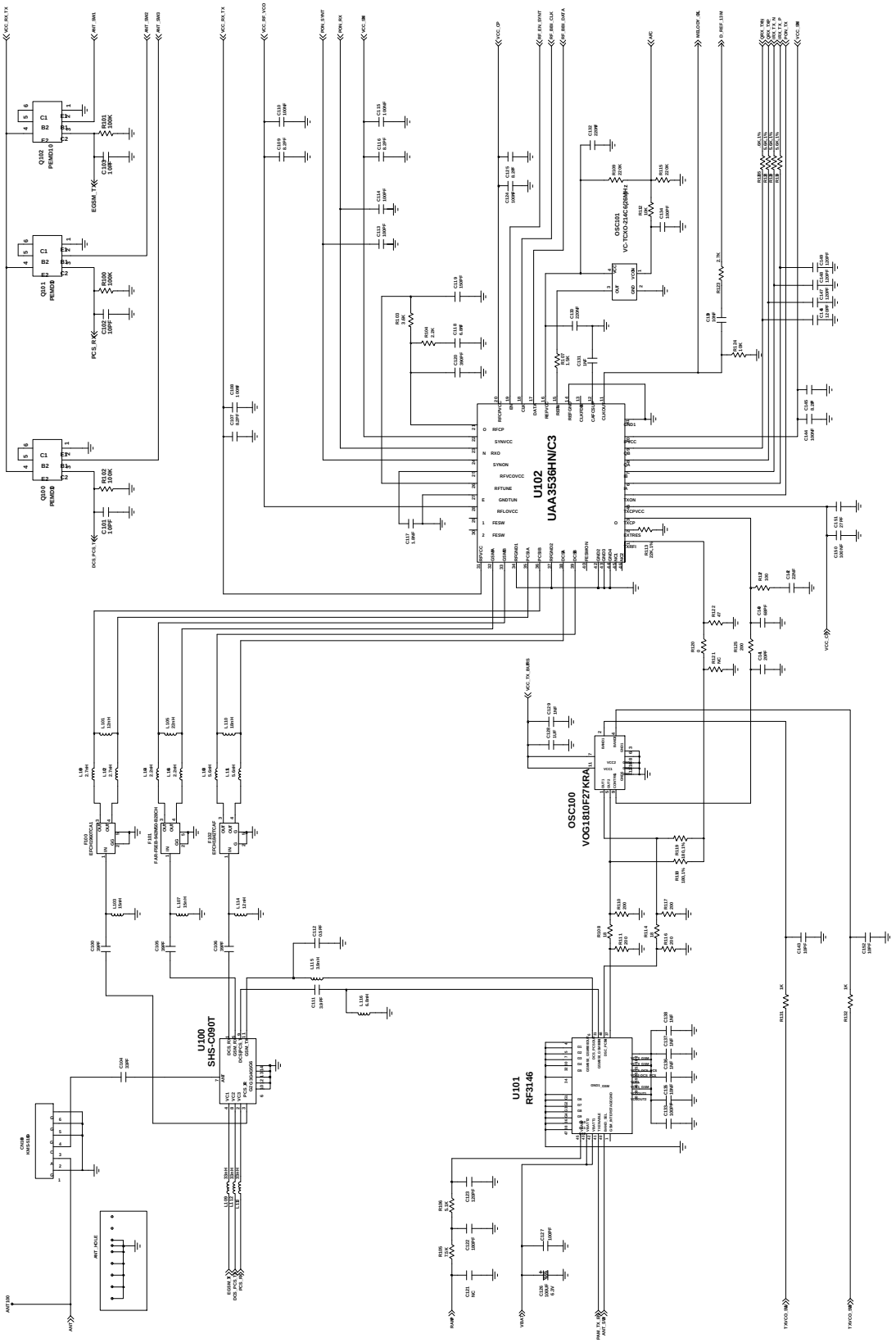

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